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RHODOSPERMEÆ,

OR

RED SEA-WEEDS.

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PHYCOLOGIA BRITANNICA:

OR,

A HISTORY OF BRITISH SEA-WEEDS,

CONTAINING

COLOURED FIGURES, GENERIC AND SPECIFIC CHARACTERS,
SYNONYMES, AND DESCRIPTIONS

OF

ALL THE SPECIES OF ALGÆ INHABITING THE SHORES OF THE

BRITISH ISLANDS.

BY

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IN FOUR VOLUMES.

VOL. III.

RHODOSPERMEÆ, OR RED SEA-WEEDS:

PART II.

(*Cryptonemiaceæ* and *Ceramiceæ*.)

SYNOPSIS, No. 190 to 279.

LONDON:

REEVE AND BENHAM,
HENRIETTA STREET, COVENT GARDEN.

1846-51.

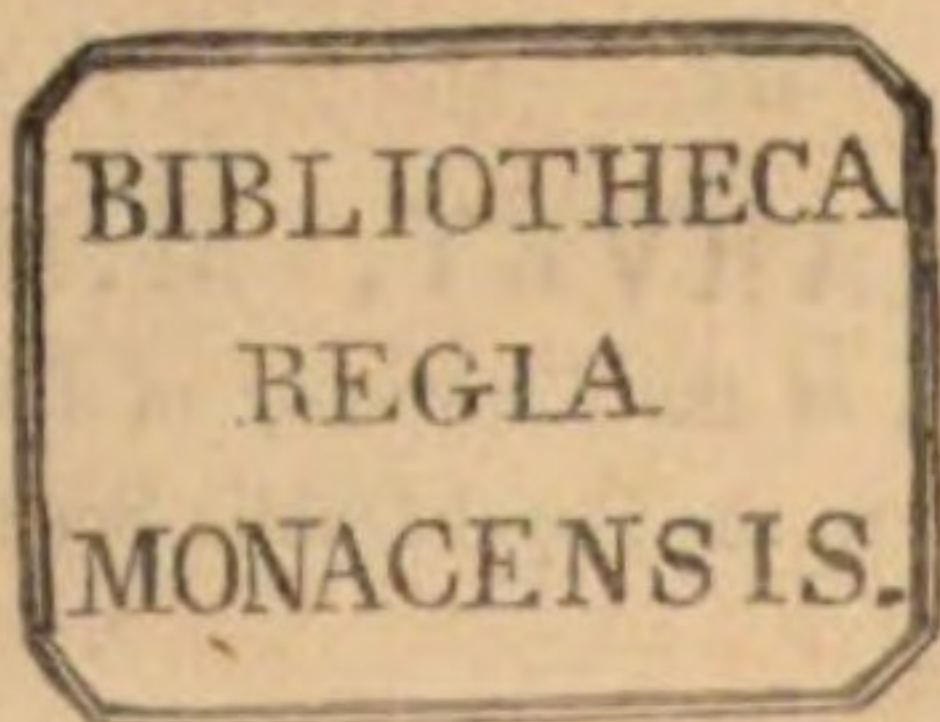




PLATE C.

GRATELOUPIA FILICINA, *Ag.*

GEN. CHAR. *Fron*d flat, more or less pinnate, membranaceous, flexible, solid, composed of densely interwoven, anastomosing, branching filaments; those of the periphery moniliform, short and very strongly compacted together. *Fructification*; 1, globular masses of spores (*favellidia*) immersed beneath the peripheric stratum, and communicating with the surface by a pore; 2, cruciate *tetraspores* vertically placed among the filaments of the periphery, in sub-defined sori.—GRATELOUPIA (*Ag.*), in honour of *Dr. Grateloup*, a French Algologist.

GRATELOUPIA *filicina*; frond linear, narrow, tapering to either extremity, irregularly once or twice pinnated; pinnæ flexuous, patent, contracted at the base and attenuated towards the apex.

GRATELOUPIA *filicina*, *Ag. Sp. Alg.* vol. i. p. 224. *Syst.* p. 241. *Spreng. Syst. Veg.* vol. iv. p. 334. *Grev. Alg. Brit.* p. 151. t. 16. *Hook. Br. Fl.* vol. ii. p. 306. *Wyatt, Alg. Danm.* no. 123. *Harv. Man.* p. 83. *J. Ag. Medit.* p. 103. *Endl. 3rd Suppl.* p. 41. *Kütz. Phyc. Gen.* p. 397. *Mont. Fl. Alger.*

GRATELOUPIA *porracea*, *Kütz. Phyc. Gen.* p. 397.

DELESSERIA *filicina*, *Lamour. Ess.* p. 38.

GELIDIUM *neglectum*, *Bory, Fl. Pelop.* p.

FUCUS *filicinus*, *Wulf. in Jacq. Coll.* vol. iii. p. 157. t. 15. f. 2. *Turn. Hist. Fuc.* t. 150. *Esper, Ic. Fuc.* vol. i. p. 134. t. 67.

HAB. On submarine rocks at half-tide level, frequently where small streamlets run into the sea. Very rare. Perennial. Winter. Sidmouth and Ilfracombe, *Miss Cutler*. Barrowcane and Hagington, *Mrs. Griffiths*. Mount's Bay, Cornwall, plentiful, and at Aberystwith, *Mr. Ralfs*.

GEOGR. DISTR. Atlantic shores of France and Spain. Abundant in the Mediterranean. Cape of Good Hope. Indian Ocean.

DESCR. *Fron*ds rising from a scutate base, tufted, seldom (in British specimens) more than two inches high, but, in warmer countries, reaching 8–10 inches in length, from half a line to a line in breadth, flexuous, flat, undivided or once or twice irregularly forked, sometimes nearly bare or with a few lateral branches, but more frequently closely pinnated with more or less regularity. *Pinnæ* opposite or alternate, patent, distichous, flexuous, tapering to a fine point, narrowed at the base, simple, often pinnulated toward the apex, the pinnulæ sometimes irregularly forked. *Tubercles* (*favellidia*) crowded toward the base of the pinnæ, in whose substance they are deeply imbedded, communicating with the surface by means of a pore, containing a mass of densely compacted spores. *Tetraspores* thickly scattered among the surface cells of accessory leaflets or pinnules, vertical, cruciately divided. *Substance* cartilagineo-membranaceous, soft, but very tough. *Colour* a dull brownish red.

The genus *Grateloupia* contains several species, all of which are natives of the warmer parts of the temperate zone, about lat. 34° to 40° . *G. filicina* is the only one which has a very wide distribution, and it extends from the tropical ocean to the southern shores of Britain, where it becomes very much dwarfed in size, but where, nevertheless, it frequently produces fruit of both kinds. In the Mediterranean Sea, where it is common, the fronds are six or eight inches in expansion, and regularly and closely bipinnate, the pinnules an inch or more in length. Specimens from the Indian Ocean are very similar. Those from the Cape of Good Hope, while they are quite as long, have a much narrower outline, with shorter pinnæ and pinnulæ.

The only British plant with which this is likely to be confounded, is *Gelidium corneum*, to some varieties of which, especially that which I have called *flexuosum* (Pl. LIII. Fig. 2), it bears a very strong external resemblance. Its softer and more membranous substance will generally distinguish it to the feel; and the microscope will point out a difference of structure, when closely examined. If in a state of fruit, there can be no difficulty in discriminating between them.

The discoverer of *G. filicina* in Britain was Miss Cutler of Sidmouth, and the earliest notice of its occurrence appeared in Dr. Greville's 'Algæ Britannicæ'. It is still a desideratum in the flora of Ireland and of Scotland, but the chances of its being met with in the latter country are very feeble.

Fig. 1. GRATELOUPIA FILICINA :—*the natural size*. 2. A pinna with tetraspores in the accessory leaflets. 3. Vertical section of the same, showing the position of the tetraspores. 4. Tetraspores. 5. A pinna with tubercles. 6. Transverse section of the same :—*all more or less highly magnified*.



PLATE LIII.

GELIDIUM CORNEUM, *Lamour.*

GEN. CHAR. *Fron*d linear, compressed, pinnated; its *axis* composed of densely interwoven, longitudinal, tenacious, continuous fibres; the *periphery* of small, polygonal cellules. *Fructification* of two kinds on distinct individuals; 1, *tubercles* (*favellidia*) immersed in swollen ramuli, containing a spherical mass of oblong spores. 2, *tetraspores* contained in club-shaped ramuli, bipartite or tripartite. GELIDIUM (*Lam.*)—from *gelu*, *frost*, whence also *gelatine*; but none of the species of the restricted genus are *gelatinous*!

GELIDIUM *corneum*; frond between cartilaginous and horny, flattish, distichous; branches linear, attenuated at each end, pinnate or bipinnate; pinnules opposite or alternate, patent, obtuse.

GELIDIUM *corneum*, *Lamour. Ess.* p. 41. *Grev. Alg. Brit.* p. 141. t. xv. *Hook. Br. Fl.* vol. ii. p. 305. *Harv. in Mack. Fl. Hib.* part 3. p. 203. *Wyatt, Alg. Danm.* no. 30. *Harv. Man.* p. 80. *J. Ag. Alg. Medit.* p. 102. *Endl. 3rd. Suppl.* p. 41. *Kütz. Phyc. Gen.* p. 406. *Mont. Pl. Canar.* p. 158.

SPHÆROCOCCLUS *corneus*, *Ag. Sp. Alg.* vol. i. p. 279. *Syst.* p. 225. *Hook. Fl. Scot.* part. 2. p. 104. *Grev. Fl. Edin.* p. 296. *Spreng. Syst. Veg.* vol. iv. p. 337.

FUCUS *corneus*, *Huds. Fl. Ang.* p. 585. *Stack. Ner. Brit.* p. 61. t. 12. *Turn. Syn.* vol. ii. p. 272. *E. Bot.* t. 1970. *Clem. Ess.* p. 317.

Var. β, *sesquipedale*; "frond long, between compressed and flat, linear, tripinnate, pinnæ attenuated at their base, ramuli linear, oblong, short, obtuse."—*Grev.*

GELIDIUM *corneum*, *var. sesquipedale*, *Grev. l. c.* p. 142.

FUCUS *corneus*, *var. sesquipedalis*, *Turn. Hist.* t. 257. f. f.

Var. γ, *pinnatum*; "frond narrow, tripinnate, the pinnæ patent, nearly linear, bluntish."—*Grev.*

GELIDIUM *corneum*, *var. pinnatum*, *Grev. l. c.*

FUCUS *pinnatus*, *Huds. Fl. Angl.* p. 548.

FUCUS *hypnoides*, *Desv. Fl. Atl.* vol. 2. p. 426.

Var. δ, *uniforme*; "all the pinnæ patent, attenuated at the base, obtuse at the points and scattered."—*Turn.*

GELIDIUM *corneum*, *var. uniforme*, *Grev. l. c.* p. 143.

FUCUS *corneus*, *var. uniformis*, *Turn. l. c.*

Var. ε, *capillaceum*; "frond narrow, pinnæ clustered towards its summit, nearly setaceous and somewhat erect."—*Turn.*

GELIDIUM *corneum*, *var. capillaceum*, *Grev. l. c.*

FUCUS *corneus*, *var. capillaceus*, *Turn. l. c.*

Var. ζ, *latifolium*; "frond broad, nearly flat, pinnæ linear-lanceolate, mostly simple, set with numerous, short, setaceous pinnæ."—*Grev.*

GELIDIUM *corneum*, *var. latifolium*, *Grev. l. c.*

Var. η, *confertum*; "frond compressed, repeatedly pinnated, pinnæ and pinnulæ long, very thin, acute and irregularly divided."—*Grev.*

GELIDIUM corneum, var. confertum, Grev. l. c.

FUCUS corneus, var. confertus, Turn. l. c.

Var. θ , *flexuosum*; frond rather broad, flat, very flexuous, pinnate or sub-bi-pinnate, pinnæ curved, tapering to each end, subulate.

Var. ι , *aculeatum*; "frond compressed, very thin, pinnated very irregularly, pinnæ divaricated, irregularly divided and set with minute divaricate, subulate ramuli, crowded towards the summit of the frond."—Grev.

GELIDIUM corneum, var. aculeatum, Grev. l. c.

Var. κ , *abnorme*; "frond compressed, irregularly branched, branches and pinnæ producing at their extremities, little tufts of partly deflexed ramuli."—Grev.

GELIDIUM corneum, var. abnorme, Grev. l. c. p. 144.

FUCUS corneus, var. abnormis, Turn. l. c. t. 257. f. r.

Var. λ , *pulchellum*; "frond capillary, compressed, bi-tripinnate, pinnæ between linear and clavate, obtuse."—Turn.

GELIDIUM corneum, var. pulchellum, Grev. l. c.

FUCUS corneus, var. pulchellus, Turn. l. c.

Var. μ , *claviferum*; "frond subcylindrical, capillary, irregularly divided, the ultimate ramuli or pinnulæ obovate, edged with minute, scattered teeth."—Grev.

GELIDIUM corneum, var. claviferum, Grev. l. c.

FUCUS corneus, var. clavifer, Turn. l. c.

Var. ν , *clavatum*; "frond capillary, between cartilaginous and membranaceous, decumbent, creeping; ramuli in the form of inversely lanceolate or ovate leaves, much attenuated at their insertion."—Grev.

GELIDIUM corneum, var. clavatum, Grev. l. c.

FUCUS pusillus, Stack. Ner. Brit. p. 16. t. 6. Turn. l. c. t. 79.

FUCUS cæspitosus, Stack. Ner. Brit. p. 59. t. 12.

Var. $\omicron$, *crinale*; "frond setaceous, subcylindrical, somewhat dichotomously branched, sometimes three-forked at the top, and bearing a few elliptic-oblong ramuli, attenuated at their insertion."—Grev.

GELIDIUM corneum, var. crinale, Grev. l. c.

FUCUS crinalis, Turn. Hist. Fuc. t. 198.

HAB. On submarine rocks, from the verge of high water to the extreme of low water, and, extending to a greater depth; often fringing the margin of tide pools in places shaded by other algæ. Common on all our shores.

GEOGR. DISTR. The temperate and tropical zones of both hemispheres.

A most variable plant, found in some of its varieties in almost all seas, and abundant everywhere. I have but to refer to the accompanying plate, in which I have represented some of the more striking of the British varieties; and to the elaborate analyses of Turner, in the '*Historia Fucorum*,' and of Greville in his '*Algæ Britannicæ*'. My limited space precludes the possibility of entering more fully into its history in this place.

Fig. 1. GELIDIUM CORNEUM, var. γ , *pinnatum*. 2. var. θ , *flexuosum*. 3. var. ζ , *latifolium*. 4. var. λ , *pulchellum*? 5. var. $\omicron$, *crinale*. 6. var. ν , *clavatum*. 7. var. κ , *abnorme*.



PLATE CCCXXXVII.

GELIDIUM CARTILAGINEUM, Gaill.

GEN. CHAR. *Fronde* linear, compressed, pinnated; its *axis* composed of densely interwoven, longitudinal, tenacious fibres; the periphery of small, polygonal cells. *Fructification* of two kinds, on distinct individuals: 1, *tubercles* (*favellidia*) immersed in swollen ramuli, containing a spherical mass of oblong spores; 2, *tetraspores* contained in club-shaped ramuli, bipartite or tripartite. GELIDIUM (*Lam.*),—from *gelu*, frost, whence also *gelatine*; but none of the species of the restricted genus are gelatinous.

GELIDIUM *cartilagineum*; frond several times pinnated, pinnæ and pin-
nulæ alternate, erecto-patent, with rounded axils, linear, obtuse;
tubercles elliptical, mucronate, immersed in the ultimate pinnules.

GELIDIUM *cartilagineum*, Gaill. *Résum.* p. 15. *Duby, Bot. Gall.* p. 948.
Grev. Alg. Brit. p. 140. *Hook. Br. Fl.* vol. ii. p. 304. *Harv. Man.* ed. 1.
p. 81. ed. 2. p. 139. *Kütz. Phyc. Gen.* p. 406. t. 73 (*Anatomy*). *Sp.*
Alg. p. 763.

GELIDIUM *concatenatum*, *Lamour. Ess.* p. 41.

GELIDIUM *versicolor*, *Lamour. Ess.* p. 41.

SPHEROCOCCUS *cartilagineus*, *Ag. Sp. Alg.* vol. i. p. 286. *Ag. Syst.* p. 227.

FUCUS *cartilagineus*, *Linn. Sp. Pl.* p. 1630. *Gun. Fl. Norv.* p. 108. t. 3. f. 5.
Esper, Ic. Fuc. t. 1. *Turn. Syn.* vol. ii. p. 284. *Turn. Hist.* t. 124. *E.*
Bot. t. 1477.

FUCUS *capensis*, *Gm. Hist. Fuc.* p. 157. t. 17. f. 1.

FUCUS *versicolor*, *Gm. l. c.* p. 158. t. 17. f. 2.

HAB. Thrown ashore, occasionally, on the south coasts of England.
Perennial. Freshwater Bay, Isle of Wight, *Dr. Withering* (*Turn.*
Syn. l. c.) Picked up at Ryde, Isle of Wight, in 1849, by *Mr.*
Sheppard (*Miss Gifford*, in litt.)

GEOGR. DISTR. Cape of Good Hope, and Port Natal; abundant. California.
Canary Islands. Chinese Sea. (*Adriatic, Wulfen.* Near Nice, *Allioni.*
Northern Ocean, as by Finmark, here and there, *Gunner*:—*vide Turn. Hist.*
vol. ii. p. 138.)

DESCR. *Root* fibrous, matted, extensively spreading. *Fronde*s tufted, from one
to two feet in length, linear, compressed, scarcely a line in breadth; *stem*
undivided or once or twice forked, usually naked below, set in the upper
half with decompoundly pinnated spreading branches. *Branches* three or
four times pinnate, ovate in outline, the lowermost pinnæ being longest

and most compound, the upper more simple, and the ultimate ones frequently quite simple and spine-like, in which case the apex of the branch runs out in a long acumination. *Pinnæ* and *pinnulæ* linear, obtuse, inserted at wide angles or somewhat horizontal, but the apices usually curved inwards, so as to make the general direction of the ramulus erecto-patent. *Substance* cartilaginous, tough. *Colour*, when quite recent, a very dark brown-red or purplish-red, but after exposure passing through scarlet, orange, yellow, and light green, to white.

This fine species was first introduced to the British Flora by Mr. Turner, in his *Synopsis* (1802), on the authority of specimens collected by Dr. Withering; but in the *Historia Fucorum* (1809) its British habitat is, as Dr. Greville observes, altogether omitted, and it is not alluded to in any way as a British plant. In English Botany it is retained on the authority of Dr. Withering's specimens, which are said to have been collected a short time before that author's death. The *Fucus cartilagineus* of his work (vol. iv. p. 119) has no reference to these specimens, but is merely copied from Hudson (Fl. Ang. 586), whose synonym is commonly referred to *Sphærococcus coronopifolius*.

I am indebted to Miss Gifford for a specimen, from which the figure now given has been prepared, and which forms a part of a tuft of fronds picked up on the shore near Ryde, by Mr. Sheppard. I do not, however, consider the claims of this plant to be regarded as British at all increased by the discovery of these specimens, which were probably thrown overboard from some ship at Spithead, and wafted ashore. They have all the appearance of being Cape-grown: in size and colour, and whole aspect, they are identical with the usual specimens brought by sailors from that coast. Were the plant of British growth we should expect to find some characteristic mark, or, at least, that it would be thrown up from the sea in an unbleached state. From the geographical range of this plant, it is highly improbable that it should be a native of our shores. The nearest point to our shores of any of its well-ascertained habitats, is at the Canary Islands; the Mediterranean habitats being very uncertain, and that in Finland evidently a mistake.

Fig. 1. *GELIDIUM CARTILAGINEUM*:—*the natural size*. 2. One of the *pinnæ*:
—*slightly magnified*.



PLATE CCXXXII.

GIGARTINA PISTILLATA, *Lamour*.

GEN. CHAR. *Fronde* cartilaginous, either filiform, compressed or flat, irregularly divided, purplish red; the *axis*, or central substance, composed of branching and anastomosing longitudinal filaments; the *periphery* of dichotomous filaments laxly set in pellucid jelly, their apices moniliform, strongly united together. *Fructification* double, on distinct plants; 1, external *tubercles* containing, on a central placenta, dense clusters of spores (*favellidia*) held together by a network of fibres; 2, *tetraspores* scattered among the filaments of the periphery, or aggregated in dense, immersed sori. GIGARTINA (*Lam.*), —from *γυαρον*, a *grape stone*, which the tubercles resemble.

GIGARTINA *pistillata*; frond compressed, stipitate, flabellately branched; branches repeatedly forked, with wide, rounded axils, naked, or pinnated with short, horizontal ramuli; apices acute; tubercles solitary or in pairs, on the ramuli; tetraspores chained together, in immersed sori, forming distortions in the branches.

GIGARTINA *pistillata*, *Lamour. Ess.* p. 49. *Grev. Alg. Brit.* p. 146. *Hook. Br. Fl.* vol. ii. p. 300. *Harv. Man.* p. 75. *Endl. 3rd Suppl.* p. 41. *Kütz. Phyc. Gen.* p. 402. t. 70. f. 1. *Mont. Fl. Algier.* p. 99.

SPHÆROCOCCUS *gigartinus*, *Ag. Sp. Alg.* vol. i. p. 274. *Ag. Syst.* p. 224.

FUCUS *pistillatus*, *Gmel. Fuc.* p. 159. t. 12. f. 1. *Lam. Diss.* p. 51. t. 27.

FUCUS *gigartinus*, *Linn. Syst. Nat.* vol. ii. p. 719. *Good. and Woodw. Linn. Trans.* vol. iii. p. 183. t. 17. f. 3, 4. *E. Bot.* t. 908. *With.* vol. iv. p. 111. *Turn. Syn.* vol. ii. p. 280. *Turn. Hist.* t. 28.

FUCUS *Ederi*, *Esper*, t. 135.

CERAMIMUM *gigartinum*, *Roth, Cat.* vol. iii. p. 109.

HAB. On rocks, near low-water mark. Perennial. Winter. Very rare. Coast of Cornwall, in several places. Discovered by the *Hon. Dr. Wenman* before 1800. St. Ives, *Stackhouse*. Penzance, *Brodie*. Padstow, *Miss Hill*. Rocks under St. Minver, at the mouth of the Padstow River, *Mrs. Griffiths*. Mount's Bay, *Dr. M'Culloch*. Whitsand Bay, *Dr. Jacob* (1829); *Mr. Gilbert Sanders* (1848), &c. Jersey, *Miss Turner*.

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean sea.

DESCR. *Root* a broad, fleshy disc. *Fronde*s densely tufted, two to six inches high, compressed, rising with an undivided stem or stipe to the height of one or two inches, then branched in a fan-like manner; the branching normally dichotomous, and repeatedly forked, but from some of the internodes being very short, or altogether suppressed, various irregularities in branching occur. All the divisions are very patent, with wide, rounded axils; and the ultimate branches gradually taper upwards, and end in an

acute point. Barren specimens and those which produce tetraspores, have the forked branches usually naked; in tubercle-bearing individuals, on the contrary, they are pinnated with short, horizontal, simple or forked ramuli, two to three lines long. *Tubercles* borne on the ramuli, either at their apices or more commonly below the point, which projects like a horn, solitary, or two or more together, usually very abundantly produced. *Tetraspores* contained in dark coloured swellings of the branches immersed in the substance; each sorus of large size, thick, containing innumerable chained cruciate tetraspores. *Substance* cartilaginous, shrinking very much in drying. *Colour*, a dull purplish or brownish-red. It does not adhere to paper in drying, unless after long steeping in fresh water.

For splendid specimens, fresh from the sea, of this very rare Alga, I am indebted to Mr. Gilbert Sanders of Plymouth, who was so fortunate, towards the close of last year, as to re-discover an old habitat where the plant had been sought for many years, and not found since 1829. From one of Mr. Sanders' newly gathered specimens our figure has been taken.

The characters of this species are so strongly marked, especially when in tubercular fruit, as is commonly the case, that it can scarcely be mistaken for anything else. In habit *G. mammillosa* comes nearest to it, but the channelled frond of that species affords a sufficient character. Barren specimens, or specimens with tetrasporic fruit, have rather the aspect of very narrow individuals of *Chondrus crispus*, but they seldom occur except in company with unmistakable forms.

All the specimens received from Mr. Sanders bore tubercles. I have since been favoured by Dr. Cocks, with specimens well furnished with tetraspores. The latter are contained in very dense sori, something resembling nemathecia, sunk in the substance of the frond.

Fig. 1. GIGARTINA PISTILLATA:—*of the natural size.* 2. Part of a branch with fertile ramuli. 3. Section of a tubercle. 4. Spores from the same. 5. Section of a sorus. 6. Tetraspores from the same. 7. Transverse semi-section of a small portion of the frond:—*all more or less highly magnified.*

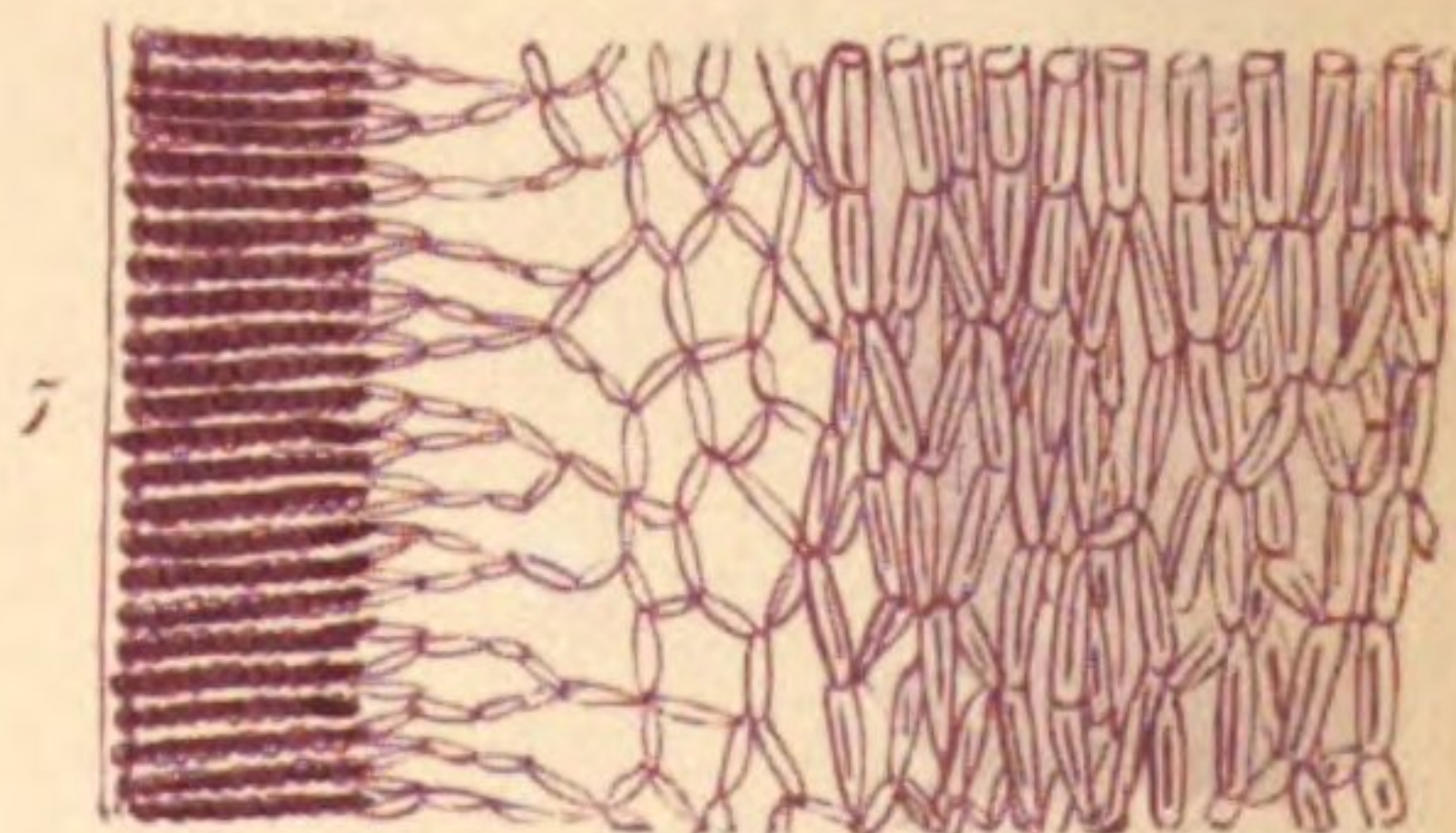
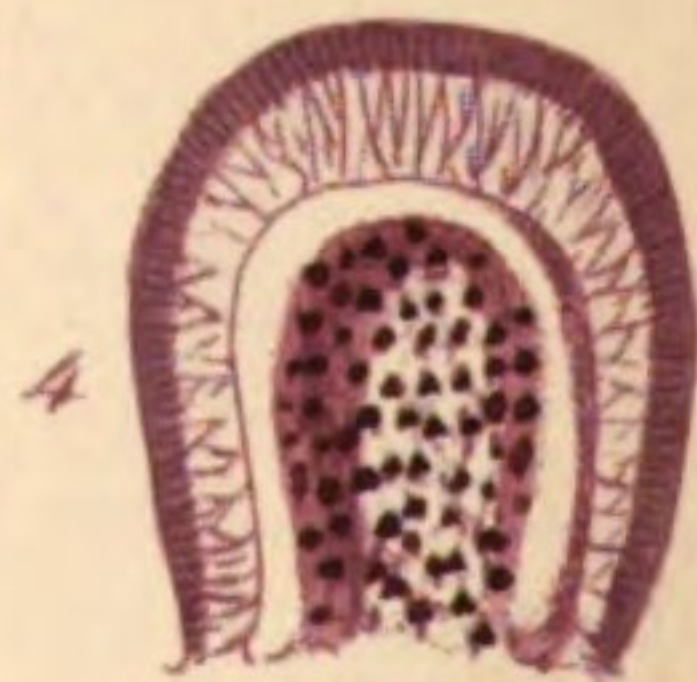
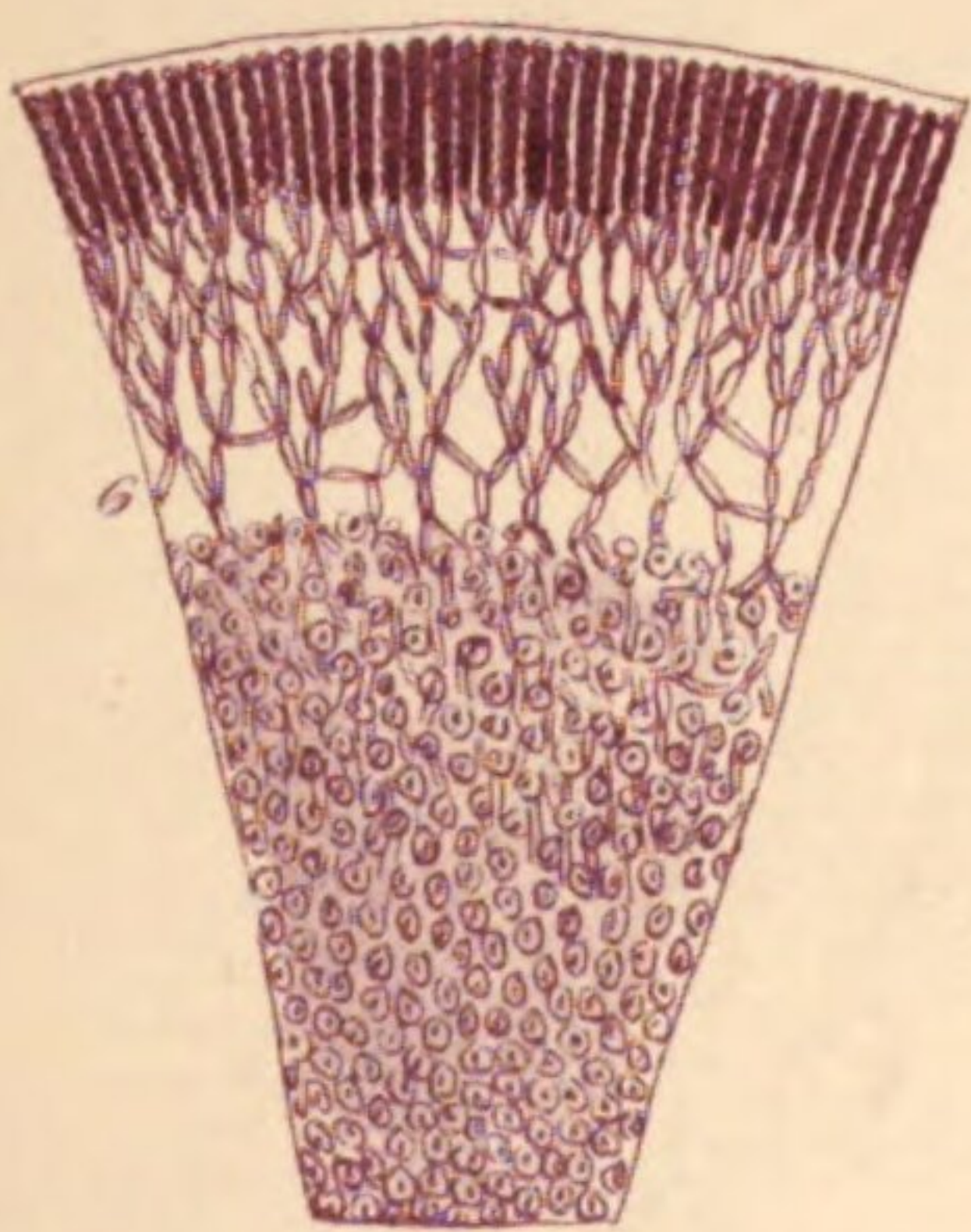


PLATE CIV.

GIGARTINA ACICULARIS, *Lamour.*

GEN. CHAR. *Frond* cartilaginous, either filiform, compressed or flat, irregularly divided; purplish-red; the *axis* or central substance composed of branching and anastomosing longitudinal filaments; the *periphery* of dichotomous filaments laxly set in pellucid jelly; their apices moniliform, strongly united together. *Fructification* double, on distinct plants; 1. external *tubercles* containing, on a central placenta, dense clusters of spores (*favellidia*) held together by a net-work of fibres; 2, *tetraspores* scattered among the filaments of the periphery.—GIGARTINA (*Lamour.*), from γίγαρτον, a *grape-stone*; which the tubercles resemble.

GIGARTINA *acicularis*; frond cylindrical, filiform, irregularly branched, between pinnated and dichotomous; branches divaricating, curved; ramuli few, very patent or recurved, subulate, often secund; tubercles spherical, scattered on the branches.

GIGARTINA *acicularis*, *Lamx. Ess.* p. 49. *Gaill. Dict. Sc. Nat.* 53. p. 365. *Duby. Bot. Gall.* p. 953. *Grev. Alg. Brit.* p. 147. t. 16. *Hook. Br. Fl.* vol. 2. p. 300. *Wyatt, Alg. Danm.* No. 26. *Harv. Man.* p. 75. *J. Ag. Alg. Medit.* p. 105. *Mont. Fl. Alger.* p. 100. *Kütz. Phyc. Gen.* p. 403.

SPHÆROCOCCLUS *acicularis*, *Ag. Sp. Alg.* 1. p. 322. *Ag. Syst.* p. 237.

FUCUS *acicularis*, *Wulf. Crypt. Aquat.* No. 50. *Turn. Hist.* t. 126. *Sm. Eng. Bot.* t. 2190.

HAB. On submarine rocks, near low-water mark. Annual. Winter. Rare. Cornwall, *Mr. W. Rashleigh*. Ilfracombe, Lupton Cove and Torquay. *Mrs. Griffiths*. Sidmouth, *Miss Cutler*. Jersey, *Miss White and Miss Turner*. Belfast Bay, *Mr. Templeton*. Valentia, abundant; Kilkee, very rare, *W. H. H.*

GEOGR. DISTR. Abundant on the shores of France and Spain. Mediterranean Sea. Indian ocean, *Wight*. Tasmania, *Dr. Hooker*.

DESCR. *Root* discoid, accompanied by decumbent, branching fibres. *Fronde* two to four inches high, as thick as small twine, densely tufted, and often matted together, very irregularly branched; sometimes the main divisions of the frond are tolerably regularly dichotomous, four or five times divided, with very patent axils, and long naked segments, forked at the tips, and bare of ramuli; sometimes and more frequently, they are more or less regularly pinnate, the main stem angularly flexuous, furnished with several, opposite or alternate, divaricating, or frequently recurved, elongated sub-simple, and nearly distichous branches, which are naked below, and more or less furnished in their upper part with very patent ramuli. *Ramuli* various in length, sometimes short and spine-like, sometimes elongate and furnished with a second series, all tapering to an acute point. *Substance* firmly cartilaginous, when first gathered long resisting the action of fresh water;

but if once dried, and again moistened, it soon decomposes. *Tubercles* very rare, as large as poppy-seed, irregularly scattered over the branches and ramuli. *Tetraspores* I have not seen. *Colour* a dull purple red, becoming pink in fresh water.

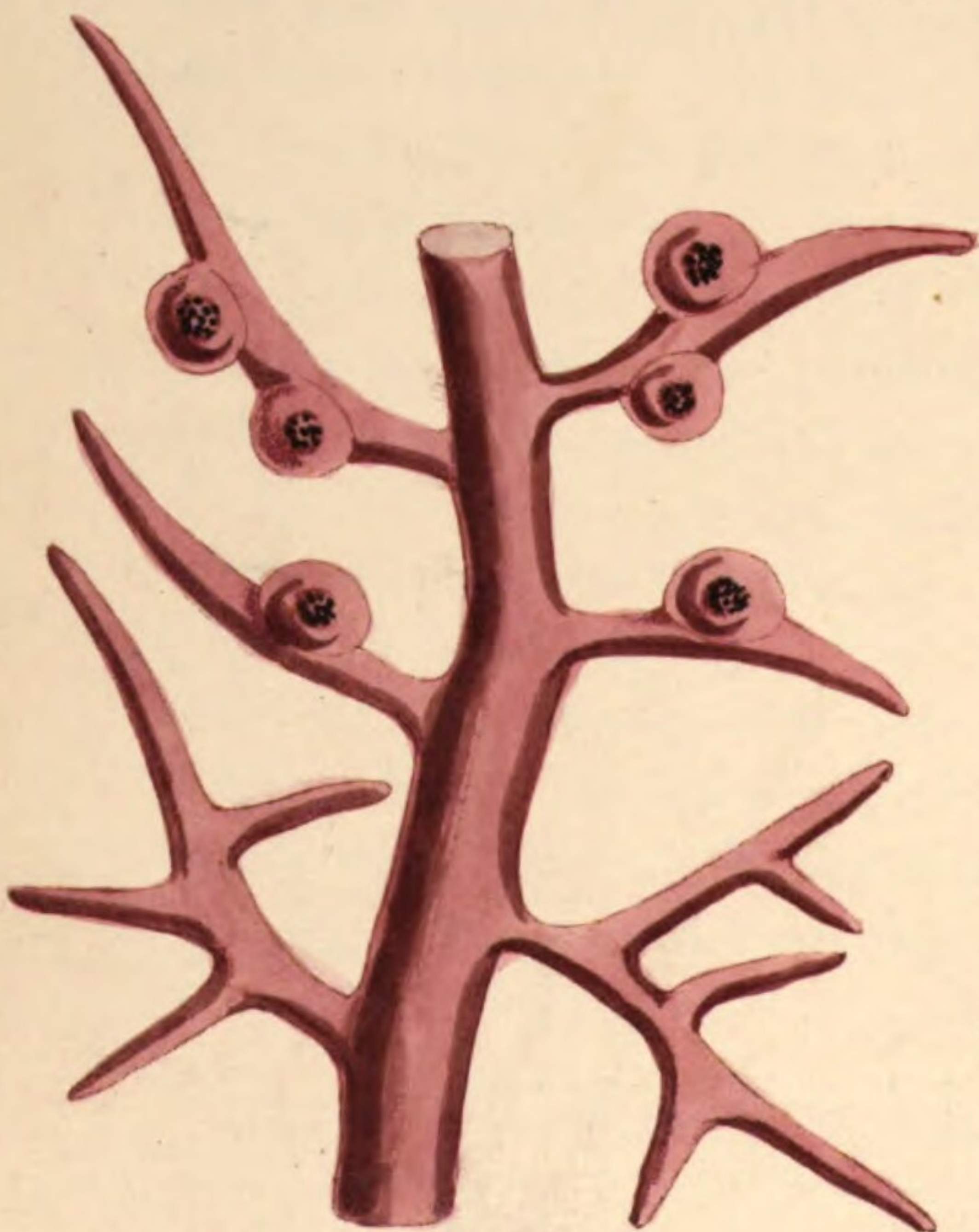
The genus *Gigartina* has been peculiarly unfortunate in the revolutions which it has undergone according to the views of different authors, or of the same authors at different times. As originally established by Lamouroux, its limits were very uncertain indeed, and it included a heterogeneous assemblage of species among which *Laurencia dasyphylla*, *Rhodomela subfusca*, *Chordaria flagelliformis*, and the *Chylocladiæ*, with several others were associated together. Lyngbye, while he weeded out several false species added to the confusion by introducing *Desmarestia viridis*. The first real reformation of the genus was that proposed by Dr. Greville in 1830, though he has admitted some species of an opposite structure to that of his type, and excluded others which coincide with it. I was myself accessory to a step being made in the wrong direction in Sir W. J. Hooker's 'British Flora', where the *Gracilariæ* are erroneously combined with the *Gigartinae*. That the combination is unnatural will be evident by a comparison of the magnified sections of our present plate, with those given of *Gr. confervoides* at Pl. LXV.; the structures are widely different. The last revision of the genus, by Professor J. Agardh, has at length fixed structural limits, more natural than those ascertained by mere outward habit, and from this results the rather startling fact, that *Iridæa radula*, Bory, is a true species of *Gigartina*. Separated from its affinities such a connexion would hardly be supposed, but the passage through *Iridæa stiriata*, to *Gigartina livida*, and from that to the subject of our present plate is easy and natural.

Besides *G. acicularis*, we have two other British species, *G. pistillata* and *Teedii*, both plants of extreme rarity in this country, though abundant in the South of Europe. *G. plicata* and *G. Griffithsiæ*, of 'British Flora' have been formed into a separate genus; and the remaining species restored to *Gracilaria*.

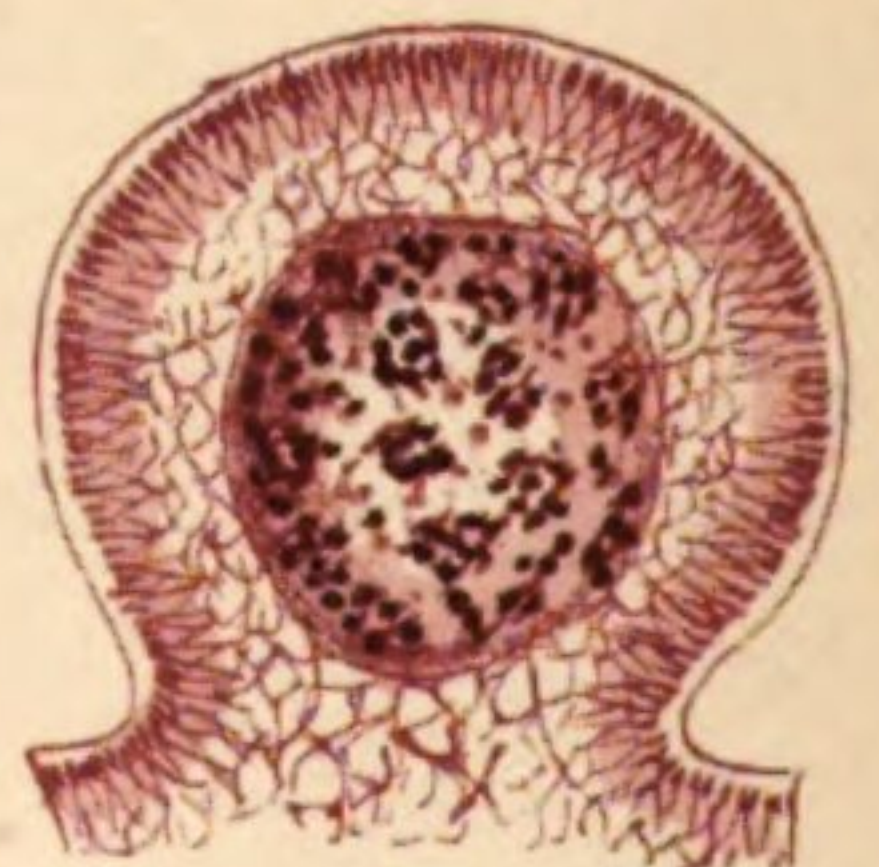
Fig. 1. *GIGARTINA ACICULARIS*, a barren specimen. 2. A specimen in fruit; both of the natural size. 3. A ramulus with tubercles. 4. A section of a tubercle. 5. Spores. 6. Part of a transverse section of the frond. 7. Part of a longitudinal section:—all magnified, the two latter figures highly so.



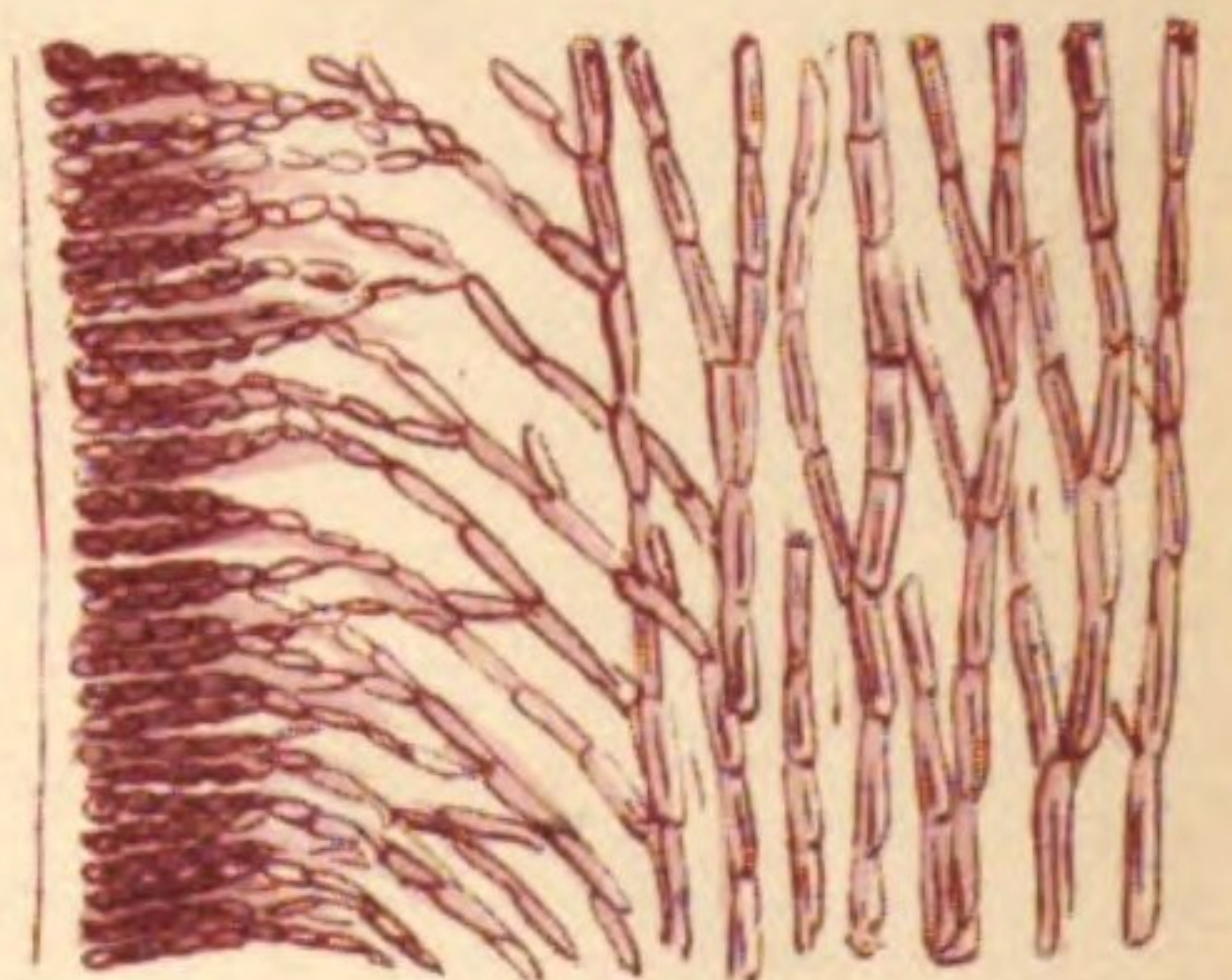
1.



2.



3.



4.

PLATE CCLXVI.

GIGARTINA TEEDII, *Lamour.*

GEN. CHAR. *Frond* cartilaginous, either filiform compressed or flat, irregularly divided, purplish-red; the axis or central substance composed of branching anastomosing longitudinal fibres; the periphery of dichotomous filaments, laxly set in pellucid jelly; their apices moniliform, strongly united together. *Fructification* double, on distinct plants; 1, external *tubercles*, containing, on a central placenta, dense clusters of *spores*, scattered among the filaments of the periphery. GIGARTINA (*Lamour.*),—from γιγάρτον, a *grape stone*, which the tubercles resemble.

GIGARTINA *Teedii*; frond cartilagineo-membranaceous, flaccid, flat, linear, acuminate, repeatedly pinnate; the pinnæ opposite or alternate, horizontally patent, distichous, set with horizontal, spine-like ramuli; coccidia globose, on the ramuli, sessile.

GIGARTINA *Teedii*, *Lamour. Ess.* p. 49. t. 4. f. 11. *Hook. Br. Fl.* vol. ii. p. 301. *Wyatt, Alg. Damn.* no. 27. *Harv. Man.* ed. 1. p. 76. *Endl. 3rd Suppl.* p. 42.

CHONDRACANTHUS *Teedii*, *Kütz. Phyc.* p. 399.

RHODOMENIA *Teedii*, *Grev. Alg. Brit.* p. 96.

SPHEROCOCCUS *Teedii*, *Ag. Sp. Alg.* vol. i. p. 277. *Ag. Syst. Alg.* p. 225. *Grev. Crypt. Fl.* t. 356.

FUCUS *Teedii*, *Roth, Cat. Bot.* vol. iii. p. 108. t. 4. *Turn. Hist. Fuc.* t. 208.

HAB. On rocks, at the extreme limit of low water. Perennial. Very rare. Elberry Cove, Torbay, *Mrs. Griffiths* (1811).

GEOGR. DISTR. Atlantic coasts of France, Spain, and Portugal. Abundant in the Mediterranean.

DESCR. *Root* a flattened disc. *Fronds* numerous from the same base, densely tufted, from three to six inches long, distichous, excessively branched in a more or less regularly pinnate manner, all the divisions horizontally patent. The main stems are from one to two, or, in very luxuriant specimens, three or four lines in breadth in the middle, and taper towards both ends, being attenuated upwards into a long slender point. They are either simple or forked, or irregularly cloven, flexuous, and closely beset with lateral branches which are simply, doubly, or trebly pinnate, and always beset with short, spine-like, horizontally patent ramuli. Different specimens vary much in the amount of branching, and in the breadth of the frond. *Fructification* has not been found in this country. The favellidia are enclosed in tubercles as large as poppy seed, plentifully scattered over the sides of the ramuli, and partially immersed in them. *Colour*, when quite recent, a dull brownish red; but in fresh water and in decay the frond assumes various tints of red and yellow, and finally becomes verdigris green. *Substance* between cartilaginous and membranaceous, soft and flexible, becoming rather horny when dry. In drying the frond shrinks considerably, and scarcely adheres to paper.

This is one of the rarest and most interesting of the British Sea-weeds. It was first found in England by Mrs. Griffiths, in the year 1811, on a small rock in Elberry Cove, growing in scattered tufts on spots left bare at the extreme limit of low water, of spring tides; and on this rock it continues to grow, and may generally be found in greater or less perfection every summer. In warm summers the plants are larger, more branching, and with broader membranes, and the tufts more numerous. Fructification has never been observed in this locality, and perhaps this is the cause why the plant appears never to have extended itself. On the opposite coast of Normandy, and southwards along the French coast, it is much more abundant, annually producing fruit; and in the Mediterranean *G. Teedii* is a very common plant. With us it seems to have reached nearly its extreme northern limit.

This plant is closely allied to *G. Chamiseoi*, of Peru, and *G. Chauvini*, of extra-tropical South America, from some varieties of which it is not always easy to separate it. In Britain it may be confounded with some states of *Gelidium corneum*; but the substance is much softer, and the structure, as seen in thin slices placed under a microscope, extremely different.

Fig. 1. GIGARTINA TEEDII:—*of the natural size.* 2. Part of a fertile frond (from a foreign specimen) with tubercles in the ramuli. 3. Section of a tubercle. 4. Longitudinal section of the frond:—*all magnified in a greater or less degree.*



PLATE CXCIX.

GIGARTINA MAMILLOSA, *J. Ag.*

GEN. CHAR. *Frond* cartilaginous, either filiform, compressed, or flat, irregularly divided, purplish-red; the axis, or central substance, composed of branching anastomosing longitudinal fibres; the periphery of dichotomous filaments, laxly set in pellucid jelly; their apices moniliform, strongly united together. *Fructification* double, on distinct plants; 1, external *tubercles*, containing, on a central placenta, dense clusters of *spores*, scattered among the filaments of the periphery. GIGARTINA (*Lamour.*),—from γυαρον, a *grape stone*; which the tubercles resemble.

GIGARTINA *mamillosa*; frond flabelliform, dichotomous, plane, channelled; segments wedge-shaped, cleft; tubercles roundish or ovate, pedicellate, scattered over the disc of the frond.

GIGARTINA *mamillosa*, *J. Ag. Alg. Medit.* p. 104. *Endl. 3rd Suppl.* p. 42.

MASTOCARPUS *mamillosus*, *Kütz. Phyc. Gen.* p. 398.

CHONDRUS *mamillosus*, *Grev. Alg. Brit.* p. 127. *Hook. Br. Fl.* vol. ii. p. 302.

Wyatt, Alg. Danm. no. 117. *Harv. in Mack. Fl. Hib.* part 3. p. 201.

Harv. Man. p. 77.

SPHÆROCOCCUS *mamillosus*, *Ag. Syn.* p. 29. *Lyngb. Hyd. Dan.* p. 14. t. 5.

Ag. Sp. Alg. vol. i. p. 260. *Ag. Syst.* p. 220. *Hook. Fl. Scot.* part 2.

p. 102. *Grev. Fl. Edin.* p. 295. *Spreng. Syst. Veg.* vol. iv. p. 336.

FUCUS *mamillosus*, *Good. and Woodw. in Linn. Trans.* vol. iii. p. 174. *Turn.*

Syn. p. 237. *Turn. Hist.* t. 218. *E. Bot.* t. 1054.

FUCUS *polymorphus*, (*fourth series*) *Lam. Diss.* p. 3. t. 17. f. 37. t. 18. f. 38.

FUCUS *echinatus*, *Stack. Ner. Brit.* p. 65. t. 12.

FUCUS *canaliculatus* β., *Huds. Fl. Ang.* p. 583.

FUCUS *ceranoides*, vars. *Lightf. Fl. Scot.* p. 916. *Gmel. Hist.* p. 115. *With.*

Arr. vol. iv. p. 99.

FUCUS *alveolatus*, *Esper. Ic.* p. 139. t. 70.

HAB. On rocks near low-water mark. Perennial. Winter. Common on all our rocky shores.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root*, a membranous expansion. *Fronds* tufted, from four to eight inches long or more, rising with an undivided stem or stipes, which is filiform at base, but almost immediately becomes compressed, and then flattened, widening gradually upwards till it attains from an eighth to a quarter of an inch in breadth. At an inch or two above the base, the stipe forks; and this mode of branching, repeated again and again, results in a many times dichotomous, flabelliform frond. The branches are more or less channelled by the introflexion of the margin; they are very commonly twisted, often in a spiral manner; and the upper ones are gradually more and more

expanded, often becoming broadly wedge-shaped. Sometimes the frond remains nearly linear throughout. The surface of barren specimens is smooth, but fertile individuals are more or less densely sprinkled over with filiform processes, which are sometimes prolonged to two or three lines; but more commonly are shorter, swelling in their upper part into an oval or globose tubercle. These processes, though sometimes borne on both surfaces, are generally most abundant on the channelled side. The *tubercles* contain, within a thick wall composed of radiant fibres, an elliptical mass of densely packed, minute *spores*. I have not seen *tetraspores*. The *structure* of the frond is dense. Its *substance* tough, between cartilaginous and leathery, very rigid when dry, and not adhering to paper. The *colour* a very dark, brownish purple, becoming brighter and more pinky after long steeping in fresh water.

A common species on all parts of our shores, and dispersed throughout the Atlantic basin. Notwithstanding its well-marked characters, it has been confounded at one time with *Fucus canaliculatus*: an error hardly to be anticipated, when the substance and colour are so exceedingly unlike; and afterwards with *Chondrus crispus*, to which there is a closer resemblance, though the channelled frond, rough with papillæ, clearly distinguish the present plant to the naked eye; while a difference in structure has latterly caused them to be placed in distinct genera. *Gigartina mamillosa* was first accurately determined and described by Goodenough and Woodward, in 1797. Its claims to specific rank have been generally admitted since that time, except by Lamouroux, who considers it a variety of *C. crispus*. Some states of the latter it, indeed, closely resembles, but is always distinguished by the channelled frond. Its officinal properties are similar to those of the *Chondrus*, and it is, on some shores, indiscriminately collected with that species, and dried as "*Carrigeen*."

I regret that our plate has been printed in rather too pale an ink.

Fig. 1. CHONDRUS MAMILLOSUS:—*of the natural size*. 2. Apex of a fertile frond:—*slightly magnified*. 3. Vertical section of a tubercle. 4. Spores from the same. 5. Vertical semisection of the frond. 6. Transverse section of the same:—*highly magnified*.



PLATE LXIII.

CHONDRUS CRISPUS, *Lyngb.*

GEN. CHAR. *Fronde* cartilaginous, nerveless, compressed or flat, flabelliform, dichotomously cleft; formed internally of three strata; the *inner*, of densely packed, longitudinal fibres; the *medial*, of small, roundish cells; the *outer*, of vertical, coloured, moniliform filaments. *Fructification*; 1, prominent *tubercles* (*nemathecia*) composed of radiating filaments, whose lower articulations are at length dissolved into *spores* (?); 2, *tetraspores* collected into sori, immersed in the substance of the frond. CHONDRUS (*Stack.*)—from *χόνδρος*, *cartilage*.

CHONDRUS *crispus*; frond stipitate, thickish, cartilaginous, flat or curled, segments wedge-shaped, very variable in breadth; apices truncate, subemarginate or cloven; axils obtuse; sori elliptical or oblong, concave on one side.

CHONDRUS *crispus*, *Lyngb. Hyd. Dan.* p. 15. t. 5. A. B. *Grev. Alg. Brit.* p. 129. t. 15. *Hook. Br. Fl.* vol. ii. p. 302. *Harv. in Mack. Fl. Hib.* part 3. p. 201. *Wyatt, Alg. Danm.* no. 118 and 119. *Endl. 3rd Suppl.* p. 39. *Harv. Man.* p. 77. *Kütz. Phyc. Gen.* p. 398. t. 73. iii.

CHONDRUS *polymorphus*, *Lamx. Ess.* p. 39.

CHONDRUS *incurvatus*, *Kütz. Phyc. Gen.* p. 399. t. 73. ii.

CHONDRUS *celticus*, *Kütz. l. c.*

SPHEROCOCCUS *crispus*, *Ag. Sp. Alg.* vol. i. p. 256. *Syst.* p. 219. *Grev. Fl. Edin.* p. 294. *Spreng. Syst. Veg.* vol. iv. p. 335.

FUCUS *crispus*, *Linn. Mant.* p. 134. *Syst. Nat.* vol. ii. p. 718. *With.* vol. iv. p. 106. *Stack. Ner. Brit.* p. 63. t. 12. *Turn. Syst.* vol. ii. p. 226. *Hist.* t. 216, 217. *Clem. Ess.* p. 313. *Wahl. Fl. Lapp.* p. 497. *E. Bot.* t. 2285.

FUCUS *ceranoides*, *Gm. Hist. Fuc.* p. 115. t. 7. f. 1. (*Excl. syn. Linn.*). *Huds. Fl. Ang.* p. 582. *Lightf. Fl. Scot.* p. 913. *Roth, Fl. Germ.* vol. iii. p. 450. *Esper, Ic. Fuc.* vol. i. p. 143. t. 98. f. 1, 2, 3.

FUCUS *membranifolius*, *With.* vol. iv. p. 106 (not of *Gooden. and Woodw.*).

FUCUS *polymorphus*, *Lamx. Diss.* p. 1. (excluding the fourth series).

FUCUS *stellatus*, *Stack. Ner. Brit.* p. 53. t. 12.

FUCUS *lacerus*, *Stack. l. c.* p. 50. t. 11.

FUCUS *crispatus*, *Fl. Dan.* t. 826.

FUCUS *filiformis*, *Huds. Fl. Ang.* p. 585.

FUCUS *patens*, *Gooden. and Woodw. in Linn. Trans.* vol. iii. p. 173.

HAB. On rocky sea shores, extending from three quarters tide level to low water mark, and beyond it. Perennial. Spring and Summer. Very abundant on the shores of the British Islands.

GEOGR. DISTR. Shores of Europe from North Cape to Gibraltar. Not found in the Mediterranean? Eastern shores of North America.

DESCR. *Root*, a flattened disc. *Fronde*s tufted, many springing from the same base, from one to ten or twelve inches in height, rising with a subcylindrical, slender stem, which soon becomes flattened, and at an inch or more from the root widens into the cuneate base of a fan-shaped, many parted frond. The segments vary much in width, and in the amount of their furcation. Sometimes they are not more than a line wide, nearly perfectly linear, flat, and very many times dichotomous; sometimes they are from one to four inches in breadth, very much curled, and broadly cuneate, overlapping each other. Sometimes the margin is quite entire and even; in other specimens it is lobed, or proliferous, or fringed with leafy processes. The apices are more or less truncate, emarginate or bifid; and the axils, especially of the broad varieties, are very blunt. The *colour* is extremely variable, ranging from a yellowish green to a livid purple, or a purplish-brown. *Fructification*; *tetraspores* collected in dense sori, contained in oval or oblong cavities irregularly scattered through the lamina of the frond, and usually concave on one side. *Substance* cartilaginous, becoming soft, and finally dissolving into a gelatine in fresh water.

So variable is the present species in appearance, under different circumstances, that it is quite impossible to enumerate the many forms it puts on, and were we to attempt to figure even the principal varieties, the figures would fill many plates. Turner has ten varieties; and Lamouroux figures thirty-five. I prefer representing two of the most opposite forms.

My upper figure shows the state of the plant when growing near low water mark, in situations exposed to the full dash of the open sea. The lower is from an estuary where a fresh water stream mixes with the sea, and brings down much mud and sand. In this situation the *Chondrus* attains even a greater size, and is frequently very much lobed and fringed.

This plant is the *Carrigeen* or Irish moss of the shops, and is used in place of isinglass in the preparation of blanc-manges, and jellies, the frond boiling down to a clear, tasteless gelatine. A few years ago it was a fashionable remedy in consumptive cases, and the collection and preparation of it for market afforded a small revenue to the industrious peasantry of the West Coast of Ireland, where it first came into use. The price at one time was as high as 2s. 6d. per lb., but the fashion has gone out, and the plant almost ceased to be collected.

Fig. 1. *CHONDRUS CRISPUS*, a *narrow* variety. 2. The same, a *broad* variety:—*natural size*. 3. Transverse section of the frond. 4. Longitudinal section:—both *magnified*. 5. Specimen producing *sori*:—*natural size*. 6. Transverse section of the frond, and of two sori. 7. Tetraspores from the sorus:—both *magnified*.



PLATE CLXXXVII.

CHONDRUS NORVEGICUS, *Lamour.*

GEN. CHAR. *Frond* cartilaginous, nerveless, compressed or flat, flabelliform, dichotomously cleft; formed internally of three strata; the *inner*, of densely packed, longitudinal fibres; the *medial* of small roundish cells; the *outer*, of vertical, coloured, moniliform filaments. *Fructification*; 1, prominent *tubercles* (*nemathecia*) composed of radiating filaments, whose lower articulations are at length dissolved into *spores* (?); 2, *tetraspores* collected into sori, immersed in the surface of the frond; 3, *favellidia*, scattered through the surface, composed of minute *spores*. CHONDRUS (*Stack.*),—from *χονδρος*, *cartilage*.

CHONDRUS *Norvegicus*; frond linear, dichotomous, flat; the axils patent; the apices rounded; favellidia minute, imbedded in the substance, or prominent, sessile warts (*nemathecia*) scattered over both surfaces of the frond.

CHONDRUS *Norvegicus*, *Lamour. Ess.* p. 39. *Lyngb. Hyd. Dan.* p. 16. *Grev. Alg. Brit.* p. 130. *Harv. Man.* p. 77. *Harv. in Mack. Fl. Hib.* part 3. p. 202. *Wyatt, Alg. Danm.* no. 120. *J. Ag. Alg. Medit.* p. 95. *Mont. Fl. Algier*, p. 117. *Endl. 3rd Suppl.* p. 39.

SPHÆROCOCCUS *Norvegicus*, *Ag. Sp. Alg.* vol. i. p. 255. *Ag. Syst.* p. 218. *Spreng. Syst. Veg.* vol. iv. p. 335.

ONCOTYLUS *Norvegicus*, *Kütz. Phyc. Gen.* p. 411.

FUCUS *Norvegicus*, *Gunn. Fl. Norv.* vol. ii. p. 122. t. 3. f. 4. *Turn. Syn.* p. 222. *Turn. Hist.* t. 41. *E. Bot.* t. 1080. *Stack. Ner. Brit.* t. 18.

FUCUS *Devoniensis*, *Grev. in Wern. Trans.* vol. iii. p. 396.

HAB. On rocks, near low-water mark. Annual? September to March. Rather rare. Dover and Swansea, *Dillwyn*. Exmouth, *Sir T. Frankland*. Devonshire (several places), *Mrs. Griffiths*. Sussex, *Mr. Borrer*. Falmouth Bay, *Miss Warren*. Mounts Bay, *Mr. Ralfs*. Plymouth, *Rev. W. S. Hore*. Bantry, *Miss Hutchins*. Youghal, *Miss Ball*. Miltown Malbay, &c., and Wicklow, *W. H. H.* Antrim, *Mr. Moore*. Saltcoats, *Rev. D. Landsborough*.

GEOGR. DISTR. Coast of Norway, *Gunner*. More frequent on the shores of France and Spain. Mediterranean Sea.

DESCR. *Root*, an expanded callus. *Fronde*s two to three inches high, more or less tufted, rising with a short, cylindrical stem, as thick as small twine, which soon forks, and almost immediately flattens, gradually widening till it becomes from an eighth to a quarter of an inch in width, again forks and repeats this process more or less regularly three or four times; the segments continuing nearly of the same breadth throughout and ending in a very blunt, simple, or emarginate point, all the axils remarkably patent. Sometimes there is scarcely any stem, the frond branching nearly from the base; in other specimens the undivided stipe is sometimes nearly

two inches in length. *Fructification* ; minute, depressed, spherical *favellidia*, immersed in the substance of the frond, and scattered through its upper segments, each with a pale margin, and filled with very numerous spores. 2, roundish or irregularly shaped *warts* (*nemathecia*), sessile on the frond, and densely scattered over its surface, wholly composed of vertical, dichotomous, moniliform filaments. *Substance* cartilaginous and firm, rather thin. *Colour* a deep, but dull, blood-red, paler, and more pinky in the younger parts. In drying, it does not adhere to paper.

The first account of this species is given by Bishop Gunner in his *Flora Norvegica*, if, indeed, the synonym of that author be correctly referred by Turner to this place ; a fact which has been more than once suspected, many believing that the plant represented by Gunner is only a variety of *C. crispus*. Mr. Dillwyn was the first to detect it on the British shores, as well as the first to notice the *nemathecia*-fructification, which is the only kind described by Turner, and is much more generally produced than the tubercles ; indeed, it is very rare to find a plant destitute of *nemathecia*. The *tubercles* have, I believe, only been found by Mrs. Griffiths at Torquay, and by her but seldom. They are at once distinguished from the *nemathecia* by their more regular form, and the colourless limb which surrounds them ; and by being evidently immersed in the substance of the frond.

Chondrus Norvegicus, if it be identical with the northern plant described by Gunner, is singularly unfortunate in its specific name, as it is much more common to the south of Norway than in that country. Even in England, it is very much more abundant on the south coast, and occurs still more frequently on the shores of France and Spain, and in the Mediterranean. Though with a general resemblance to *C. crispus*, there is something in the tone of its colour, the divaricated laciniae, and the rounded axils and apices that render it easy to be recognised, independently of the difference in fructification. The species most nearly allied to it is *C. crenulatus*, a native of Portugal, which may probably yet be added to the British list.

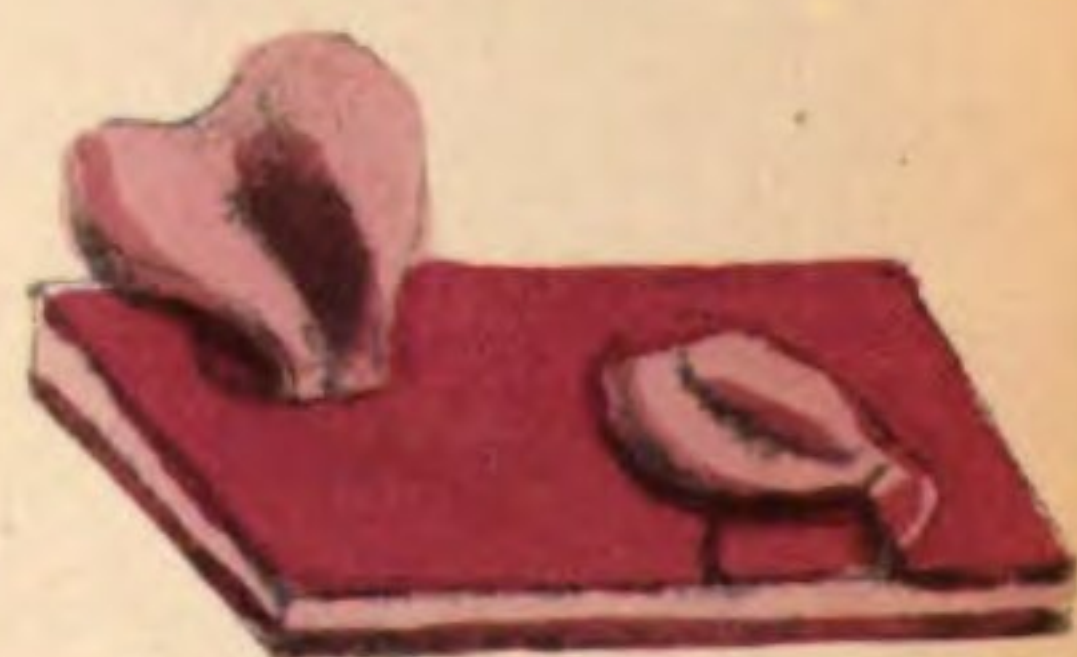
Fig. 1. CHONDRUS NORVEGICUS :—of the natural size. 2. Portion of a frond with *favellidia*. 3. Section of a *favellidium*. 4. Spores from the same. 5. Portion of a frond with *nemathecia*. 6. Section of a *nemathecium*. 7. Filament from the same :—all more or less highly magnified.



3.



6.



7.

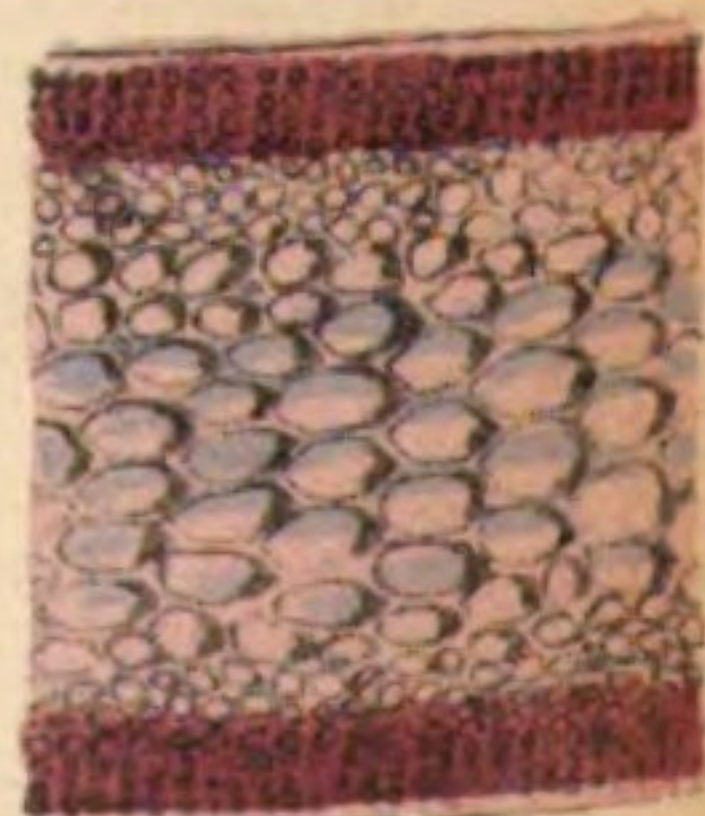


PLATE CXXXI.

PHYLLOPHORA RUBENS, Grev.

GEN. CHAR. *Frond* stipitate, rigid-membranaceous, proliferous, nerveless, or with a vanishing nerve, cellular; cells minute, angular, gradually smaller towards the surface. *Fructification*; 1, *tubercles* (*favellidia*) scattered over the frond, containing masses of minute spores; 2, *warts* (*nemathecia*) seated on the frond, composed of radiating, moniliform filaments, whose lower articulations are at length converted into spores? 3, *tetraspores* (on distinct plants) collected into sori, either towards the apex of the frond or in proper leaflets. PHYLLOPHORA (Grev.),—from φύλλον, a *leaf*, and φέρω, to *bear*.

PHYLLOPHORA *rubens*; stem very short, expanding into a sub-linear or cuneate, simple or forked, rigidly membranaceous, obscurely mid-ribbed frond, which is repeatedly proliferous from the surface; tubercles scattered, wrinkled or crested with sinuous folds; warts concealed under leafy processes.

PHYLLOPHORA *rubens*, Grev. *Alg. Brit.* p. 135. t. 15. Hook. *Br. Fl.* vol. ii. p. 303. Wyatt, *Alg. Danm.* no. 29. Harv. in Mack. *Fl. Hib.* part 3. p. 202. Harv. *Man.* p. 79. Endl. *3rd Suppl.* p. 38. Kütz. *Phyc. Gen.* p. 412.

SPHÆROCOCCLUS *rubens*, Ag. *Sp. Alg.* vol. i. p. 237. Ag. *Syst.* p. 213. Hook. *Fl. Scot.* part 2. p. 102. Grev. *Fl. Edin.* p. 296. Spreng. *Syst. Veg.* vol. iv. p. 335.

CHONDRUS *rubens*, Lyngb. *Hyd. Dan.* p. 18.

DELESSERIA *rubens*, Lamour. *Ess.* p. 38.

FUCUS *rubens*, Linn. *Sp. Pl.* p. 1630. Good. and Woodw. in Linn. *Trans.* vol. iii. p. 165. Turn. *Syn.* vol. ii. p. 216. Turn. *Hist.* t. 12. E. Bot. t. 1053. Stack. *Ner. Brit. ed. 2.* t. 19. Hook. *Iceland Tour*, vol. ii. p. 347.

FUCUS *prolifer*, Lightf. *Fl. Scot.* p. 949. t. 30. Esper, *Ic. Fuc.* t. 129.

FUCUS *epiphyllus*, Fl. Dan. t. 708.

FUCUS *crispus*, Huds. *Fl. Ang.* p. 580.

HAB. On the shelving, rocky sides of deep tide pools near low-water mark, under the shadow of *Laminariæ*; also on rocks, stones and nullipores, beyond tide marks, from four to fifteen fathoms. Perennial. Winter. Frequent on the British coasts, from Orkney to Cornwall.

GEOGR. DISTR. Atlantic coasts of Europe from Iceland to Spain. Baltic Sea.

DESCR. *Root* an expanded callus. *Fronds* densely tufted, from three to eight or ten inches in length, rising with a short cylindrical stem, which gradually passes into the flattened, obscurely mid-ribbed, attenuated base of a linear-wedge-shaped lamina; this primary lamina is sometimes quite simple, but is more frequently forked, and often many times dichotomous, each segment

being linear and very obtuse. The width of the segments is commonly about a quarter of an inch, but some varieties are nearly an inch broad. The narrower ones are always the longest. From the primary leaf spring numerous other leaves, of similar form, all of them minutely stipitate and furnished with a more or less obvious mid-rib in their lower part. *Tubercles* densely scattered over the surface of the fronds, or forming lines within the margin, spherical, fixed by a narrow base, everywhere covered with sinuous plates or folds, which give them a very wrinkled aspect; containing, under a thick pericarp composed of vertical filaments, a spherical deep-red mass, consisting of innumerable minute spores, collected in small parcels, several of which make up the aggregate mass. *Nemathecia* concealed under leafy obovate processes, which are thickly dispersed over the surfaces of distinct plants, formed altogether of moniliform filaments, which I have not observed to be converted into spores. *Tetraspores* unknown. *Colour* a fine, full deep-red, becoming darker in drying. *Substance* rigid, tough, and not adhering to paper in drying. The plant may be kept in fresh water a considerable time without injury.

A common species on all the rocky shores of Northern Europe, growing at the extremity of low-water mark under the ledges of shelving rocks, in places where it is seldom exposed either to the sun or air. When free from parasites, which is rarely the case, its clear red colour, and glossy surface render it a very ornamental plant. More usually it is disfigured by *Melobesiæ* and *Flustræ*, so as to destroy much of its beauty. It is very closely allied to the *P. nervosa* of the south of Europe, which chiefly differs in having a more strongly marked mid-rib, and a more undulating margin, characters which vary considerably in different specimens. Some specimens of *P. nervosa*, such as those represented in Turner's figure, do indeed look very different from our plant, but others in my possession exhibit scarcely a more definite nerve than is found in many British specimens of *P. rubens*.

Fig. 1. PHYLLOPHORA RUBENS:—of the natural size. 2. Tubercles, attached to the frond. 3. Section of a tubercle. 4. Spores. 5. Leafy processes, with *nemathecia* at their base. 6. Filaments from one of the *nemathecia*. 7. Section of the frond, showing the cells of which it is composed:—all more or less magnified.



PLATE CLXIII.

PHYLLOPHORA MEMBRANIFOLIA, *J. Ag.*

GEN. CHAR. *Fronde* stipitate, rigid-membranaceous, proliferous, nerveless, or with a vanishing nerve, cellular; cells minute, angular, gradually smaller towards the surface. *Fructification*; 1, *tubercles* (*favellidia*) scattered over the frond, containing masses of minute spores; 2, *warts* (*nemathecia*) seated on the frond, composed of radiating, moniliform filaments, whose lower articulations are at length converted into spores? 3, *tetraspores* (on distinct plants) collected into sori, either towards the apex of the frond, or in proper leaflets.

PHYLLOPHORA (*Grev.*),—φυλλον, a leaf, and φορεω, to bear.

PHYLLOPHORA *membranifolia*; stem cylindrical, filiform, branched; the branches expanding into broadly wedge-shaped, two-lobed or dichotomous segments; tubercles oval, on short stalks arising from the stem or leaflets; nemathecia forming broad patches in the centre of the leaflets.

PHYLLOPHORA *membranifolia*, *J. Ag. Alg. Medit.* p. 93. *Endl. 3rd Suppl.* p. 38.

RHODYMENIA *membranifolia*, *Harv. in Phyc. Br. Syst. list*, p. xii.

CHONDRUS *membranifolius*, *Grev. Alg. Brit.* p. 131. *Hook. Br. Fl.* vol. ii. p. 302. *Harv. in Mack. Fl. Hib.* part 3. p. 202. *Wyatt, Alg. Danm.* no. 76. *Harv. Man.* p. 78.

SPHÆROCOCCLUS *membranifolius*, *Ag. Syn.* p. 26. *Lyngb. Hyd. Dan.* p. 10. t. 3. *Ag. Sp. Alg.* vol. i. p. 240. *Ag. Syst.* p. 214. *Hook. Fl. Scot.* part 2. p. 102. *Grev. Fl. Edin.* p. 295. *Spreng. Syst. Veg.* vol. iv. p. 335.

FUCUS *membranifolius*, *Good. and Woodw. Lin. Trans.* vol. iii. p. 120. t. 16. f. 1. *Lam. Diss.* t. 20, 21. f. 3. *Turn. Syn.* p. 25. *Turn. Hist.* t. 74. *Sm. E. Bot.* t. 1965. *Stack. Ner. Brit.* t. 20.

FUCUS *fimbriatus*, *Huds. Fl. Angl.* p. 574.

HAB. On rocks and stones, between tide-marks. Perennial. Winter. Very common on the British coasts.

GEOGR. DISTR. Atlantic shores of Europe and North America.

DESCR. *Root* a spreading callus. *Fronde* densely tufted, from three to twelve inches in height. *Stem* slender, as thick as small twine, rigid, cylindrical, repeatedly branched in an irregularly dichotomous manner; branches simple, or bifid, one, two, or more inches in length, spreading, gradually becoming compressed upwards, and expanding into a wedge-shaped, or fan-shaped, more or less divided frondlet. *Frondlets* rigid-membranous, repeatedly dichotomous, the axils and apices obtuse, the latter sometimes bifid. In old specimens, besides the terminal frondlet, the branches give off very numerous lateral ones of a smaller size, which are simply bifid, and of a narrow wedge-shaped outline: the abundance of these sometimes makes the specimen very bushy. *Apices* fastigate. *Fructi-*

fructification: 1, roundish or oval, opaque *tubercles* borne on short stalks, which spring irregularly from the sides of the stem, and from the lower parts of the frondlets, containing, beneath a thick coat formed of closely packed filaments, a dense mass of minute spores. 2, dark-red, thickened, wart-like patches of irregular form and size, occupying the disk of the frondlet, and prominent on both surfaces, composed of moniliform filaments. These are usually found on distinct plants, but sometimes occur on those which also bear tubercles. *Tetraspores* unknown (to me). *Colour* of the frond, a deep brownish or livid purple-red; passing to greenish and whitish in decay. *Substance* rigid, somewhat cartilaginous, and thin, very tough.

This plant bears a considerable resemblance in form to *Rhodymenia Palmetta*, and still more to the *R. flabellifera* of the Southern Ocean, but the colour and the fructification, so far as the latter is known, are very different: and I agree with my valued friend Mrs. Griffiths in regarding this as a species of *Phyllophora*, nearly related to *P. Brodiaei*. In the list given at the end of our first volume a different place has been inadvertently assigned to it.

I am not aware that *tetraspores* have yet been noticed on *P. membranifolia*. The swellings of the periphery which are called *nemathecia*, and which, in their dark colour, and the high organization of their tissue, seem to be connected with fructification, are not uncommonly formed. They usually occur on individuals which do not produce tubercles; but Mrs. Griffiths once found a specimen, a part of which she has kindly communicated to me, which bears both tubercles and nemathecia. This, though a rare occurrence, is not to be wondered at, because these organs have really much resemblance to each other in structure; so much so that it is probable that one is but a metamorphic form of the other, or, at least, is an organ of an analogous nature.

Fig. 1. PHYLLOPHORA MEMBRANIFOLIA. 2. A frondlet, with *nemathecium*:—both of the natural size. 3. Vertical section of a *nemathecium*. 4. Part of the same. 5. A tubercle. 6. The same, cut across. 7. Part of a vertical section of the same. 8. Section of the frond:—all more or less highly magnified.

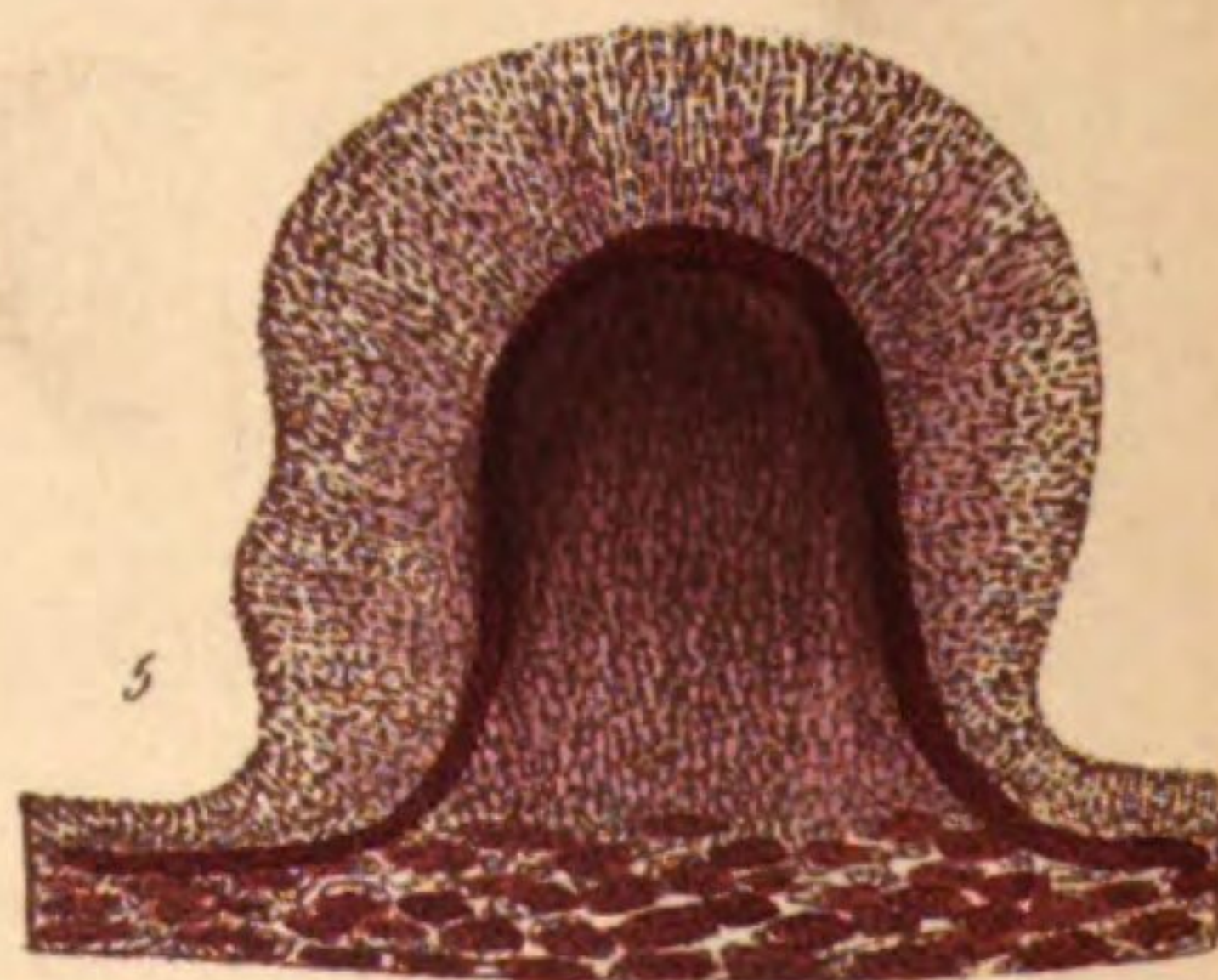
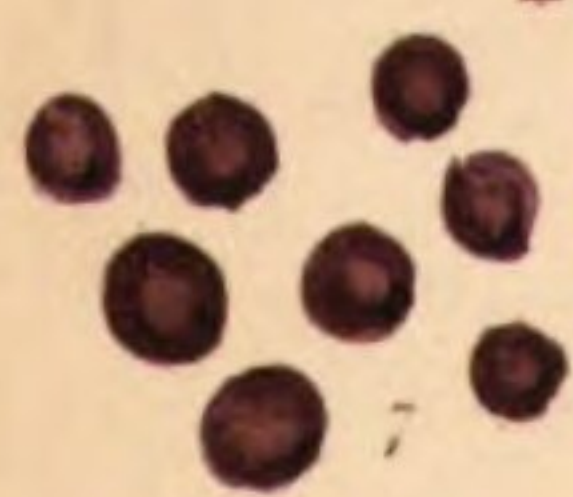
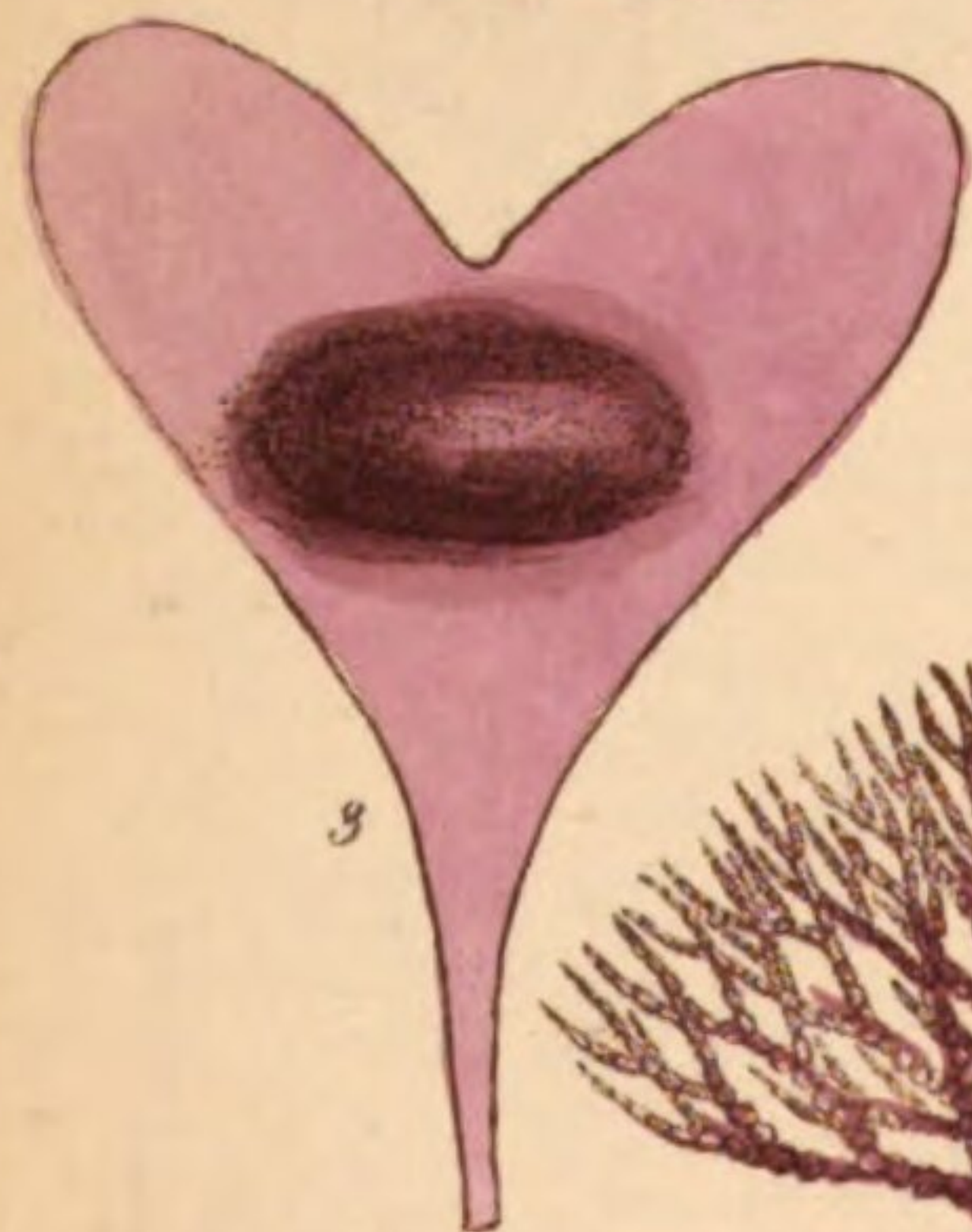


PLATE XX.

PHYLLOPHORA BRODIÆI, *J. Ag.*

GEN. CHAR. *Fronde* stipitate, rigid-membranaceous, proliferous, nerveless or with a vanishing nerve, cellular; cells minute, angular, gradually smaller toward the surface. *Fructification* of two kinds, on distinct plants;—1, prominent *tubercles* (*nemathecia*) seated on the frond, composed of radiating, moniliform filaments, whose lower articulations are at length dissolved into *spores* (?). 2, *tetraspores* collected into sori, either toward the apex of the frond, or on proper leaflets. PHYLLOPHORA—from φύλλον, a leaf, and φορέω, to bear: a proliferous frond.

PHYLLOPHORA *Brodiaei*; stem cylindrical, filiform, branched, the branches expanding into oblong, simple or forked, flat, membranaceous frondlets, which are proliferous from their extremity; tubercles sessile on the tips of the segments.

PHYLLOPHORA *Brodiaei*, *J. Ag. Alg. Medit.* p. 93. *Endl. 3rd Suppl.* p. 38.

COCCOTYLUS *Brodiaei*, *Kütz. Phyc. Gen.* p. 412.

CHONDRUS *Brodiaei*, *Grev. Alg. Brit.* p. 133. *Hook. Brit. Fl.* vol. ii. p. 303. *Mack. Fl. Hib.* part 3. p. 202. *Harv. Man.* p. 78.

SPHÆROCOCCUS *Brodiaei*, *Ag. Syn.* p. 27. *Lyngb. Hyd. Dan.* p. 11. t. 3. *Ag. Sp. Alg.* vol. i. p. 239. *Ag. Syst.* p. 213. *Grev. Fl. Edin.* p. 295.

DELESSERIA *Brodiaei*, *Lamx. Ess.* p. 37.

FUCUS *Brodiaei*, *Turn. Hist.* t. 72. *E. Bot.* t. 1966. *Fl. Dan.* t. 1476.

Var. *β. simplex*; stem short expanding into an oblong, simple or once forked, rose coloured frond; sorus elliptical, composed of tetraspores.

CHONDRUS *Brodiaei*, *β. simplex*, *Grev. Alg. Brit.* p. 133. *Hook. Br. Fl.* l. c. *Harv. Man.* l. c. *Wyatt, Alg. Brit.* no. 121.

FUCUS *membranifolius*, var. *roseus*, *Turn.* t. 74. f. m.

HAB. On rocks in the sea. Rare. Perennial? Winter and Spring. Eastern coast of Scotland, in several places. Lossiemouth, *Mr. Brodie*. Mouth of the Bann, Co. Derry, *Mr. D. Moore*. At Bangor, on Belfast Bay, *Mr. W. Thompson*. Var. *β*, Devonshire, *Mrs. Griffiths*. Malahide, *Mr. Mc'Calla*.

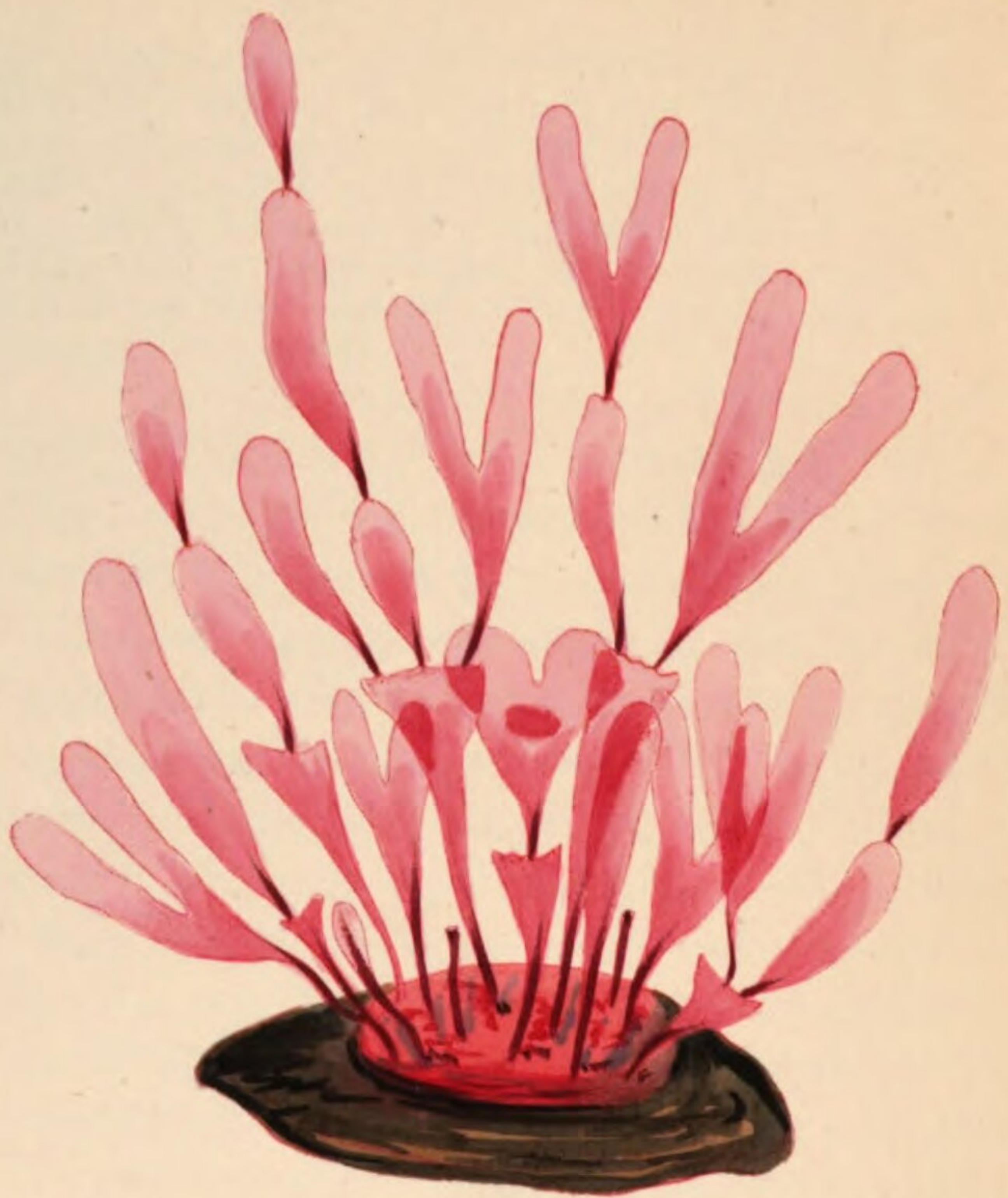
GEOGR. DISTR. Baltic Sea, *Mertens*. Denmark, *Lyngbye*. German Ocean. Atlantic coast of France, rare.

DESCR. *Root* a small disc; in *β*, a widely expanding disc. *Fronde* 2–8 inches high; the stem cylindrical, variable in length, simple or branched, the branches expanding into oblong, flat, forked or simple, wedge-shaped leaves, which vary in breadth from two to five lines, and in length from one to three inches. The *segments* are somewhat truncate, often proliferous from

the apex, the young shoot rising with a cylindrical stem, which soon expands into a frondlet resembling the primary one, and this in old specimens often gives birth to a second or third. *Tubercles* or *nemathecia* very convex, dark red, sessile on the tips of the frond, composed of dichotomous, densely packed, moniliform filaments, radiating from a centre.— β . is not quite two inches high, once or twice proliferous, of a fine rose-red colour, the frondlets often bearing above the middle a broad, elliptical, dark-red, thickened spot, composed of *tetraspores*.

“The study of natural history,” remarks Mr. Turner in his history of the present species, “independantly of the advantages so nobly ascribed by Cicero to polite literature in general, that it nourishes our youth, delights our age, is an ornament in prosperity, and a comfort in adversity, may justly boast a still superior object, in leading, and, indeed, in forcing man to the admiration of the wisdom, and the goodness of his divine Creator, in the contemplation of the works of his Almighty hand. In addition to this it mixes itself also with the daily occurrences of social life, and gratifies the best feelings of our nature, by uniting in the bonds of friendship those whose pursuits were already the same; while, by permitting the names of its votaries to be affixed to plants, it records their zeal in its service, and touches one of the most powerful springs of human action. Among those who eminently deserve to be thus mentioned, stands forward the name of James Brodie, Esq., of Brodie, in Scotland, a man at once zealous in the pursuit, and liberal in the patronage of universal science, and especially of the Botany of Britian.” Mr. Brodie was particularly attached to the study of the Algæ, among which he made many interesting discoveries, the present among the number, and during a long and active life, enjoyed the affectionate respect of a large circle of scientific friends; the genus *Brodiaea* is consecrated to his memory. The specimen of *Phyllophora Brodiaei*, which I here represent was collected by Mr. Brodie, and given to me among many others by Dr. Walker Arnott, the present owner of the Brodiaean Herbarium.

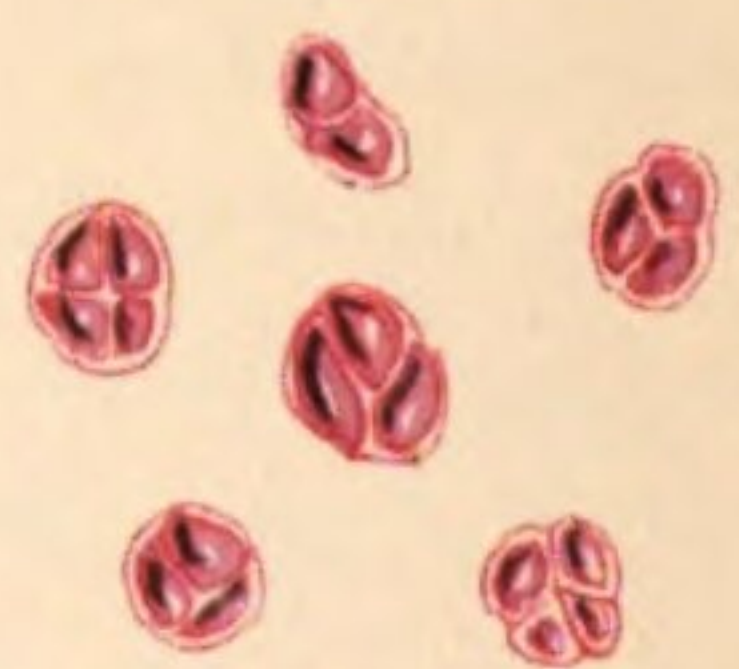
Fig. 1. PHYLLOPHORA BRODIÆI, var. *a*. 2. Var. β :—*natural size*. 3. Frondlet of var. β , with sorus. 4. Tetraspores from the same. 5. Section of nemathecium. 6. Filaments from the same. 7. Spores (?) from the same. 8. Section of the frond, to show the internal structure:—*all more or less magnified*.



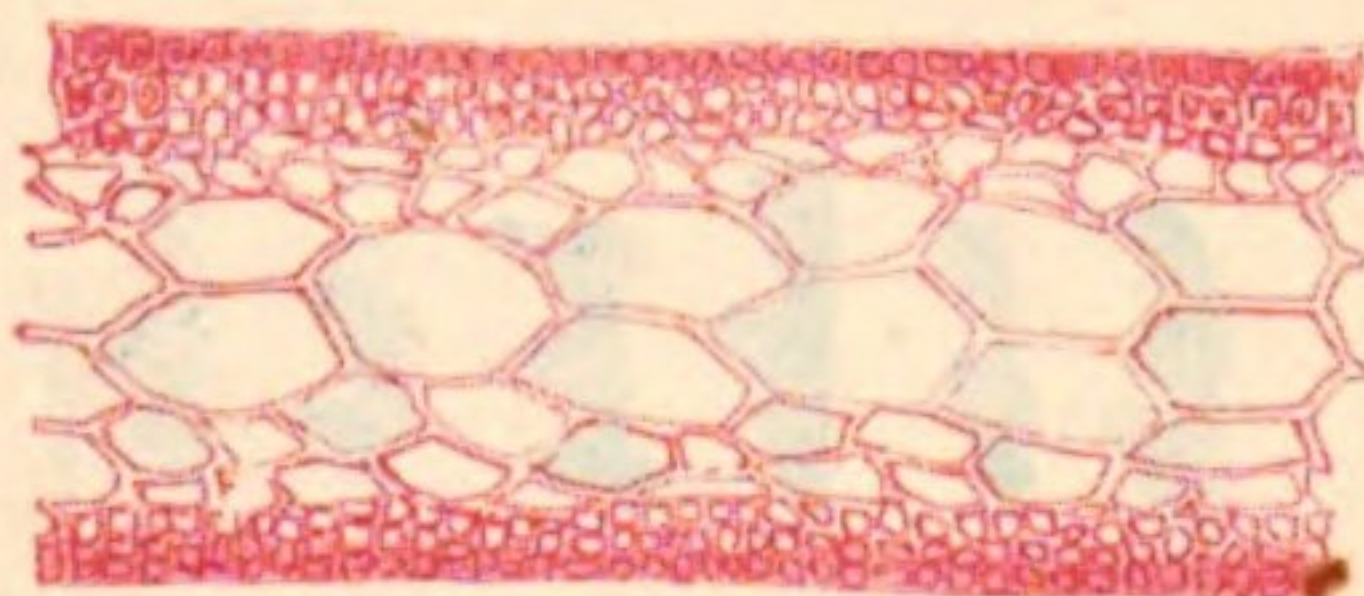
1.



2.



3.



4.

PLATE CCCX.

PHYLLOPHORA PALMETTOIDES, *J. Ag.*

GEN. CHAR. *Frond* stipitate, rigid, membranaceous, proliferous, nerveless, or with a vanishing nerve, cellular; cells minute, angular, gradually smaller towards the surface. *Fructification*, 1, *tubercles* (*favellidia*?) scattered over the frond containing masses of minute spores; 2, *warts* (*nemathecia*) seated on the frond, composed of radiating, moniliform filaments, whose lower articulations are at length changed into spores; 3, *tetraspores*, collected into sori, either towards the apex of the frond or in proper leaflets. PHYLLOPHORA (*Grev.*),—from *φυλλον*, a *leaf*, and *φορεω*, to *bear*.

PHYLLOPHORA *Palmettoides*; root a widely-expanded disc; stem cylindrical, filiform, simple or branched, expanding into an oblong, narrow-obovate or cuneate, simple or once-forked, rose-coloured frond, which is sometimes proliferous; sorus of tetraspores solitary, transverse, elliptical, near the apex of the frond, immersed in its substance.

PHYLLOPHORA *Palmettoides*, *J. Ag. in litt.* *Harv. Man.* ed. 2. p. 144.

PHYLLOPHORA *Brodiaei*, β . simplex, *Harv. Phyc. Br.* t. xx. f. 2, 3, 4.

CHONDRUS *Brodiaei*, β . simplex, *Grev. Alg. Brit.* p. 133. *Hook. Br. Fl.* vol. ii. p. 303. *Harv. Man.* ed. 1. p. 78. *Wyatt, Alg. Danm.* no. 121.

FUCUS *membranifolius*, *var. roseus*, *Turn. Hist.* t. 72. f. m.

HAB. On rocks near low-water mark. Perennial. Winter and spring. Rare. Sidmouth and Torquay, *Mrs. Griffiths* and *Miss Cutler*. Plymouth and Whitsand Bay, *Rev. W. S. Hore*.

GEOGR. DISTR. South coast of England. Mediterranean Sea.

DESCR. *Root* a widely-spreading, fleshy disc, an inch or more in diameter. *Fronds* numerous from the same disc, growing in a scattered manner, two to three or four inches in length, rising with a filiform stem to the height of an inch or an inch and a half; stem then compressed and ending in a cuneate or narrow-obovate, obtuse, simple or forked lamina; sometimes the frond is deeply forked, sometimes only emarginate; the segments frequently proliferous from the apex, or contracted in the middle, and again enlarged. When the tips are injured, the torn edge often bears numerous leaflets irregularly. *Tubercles* I have not seen. *Tetraspores* forming dense, immersed, transverse, oval sori in the centre of the lamina, very minute. *Colour* a bright rosy red. *Substance* membranous, but rather rigid, not adhering to paper, except after long soaking.

An imperfect representation of this plant has already been given in our first volume (Tab. XX. Fig. 2, 3, 4,) where it was regarded as a variety of *Phyllophora Brodiaei*, according to the views of most British botanists. In the last edition of the 'Manual' I have recognized its specific existence under the name here given, a name adopted from Prof. J. Agardh, who, in a recent letter, points out particularly the characters which distinguish this little plant from the original *P. Brodiaei*. These characters are,—the position of the sorus of tetraspores; the brighter colour of the frond; and the much more widely expanded root. To these I would add a marked difference in its geographical distribution; for while *P. Brodiaei* is confined to our northern shores, *P. palmettoides* is a native, in this country, only of the south of England, and, on the continent, is found in the Mediterranean.

Fig. 1. Fronds of PHYLLOPHORA PALMETTOIDES :—*the natural size*. 2. Frondlet with a sorus in the centre :—*slightly enlarged*. 3. Tetraspores, from the same. 4. Thin slice of the frond, to show structure :—*both highly magnified*.

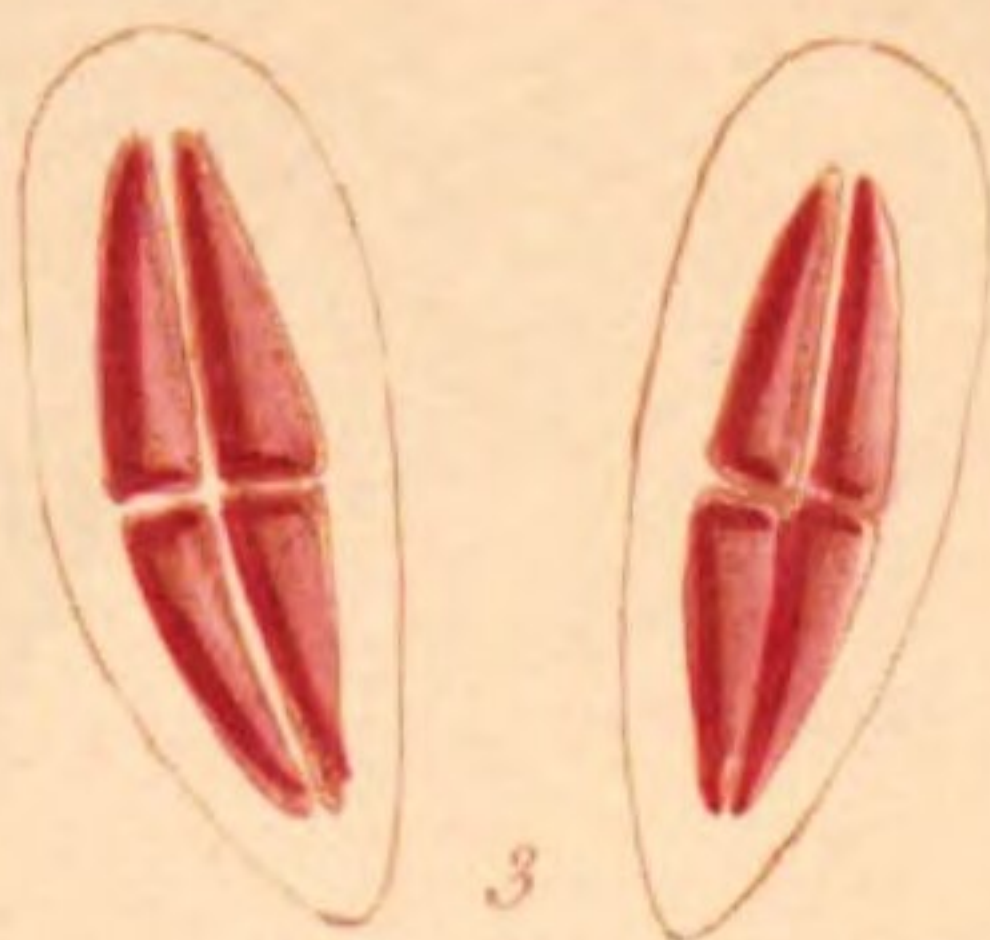
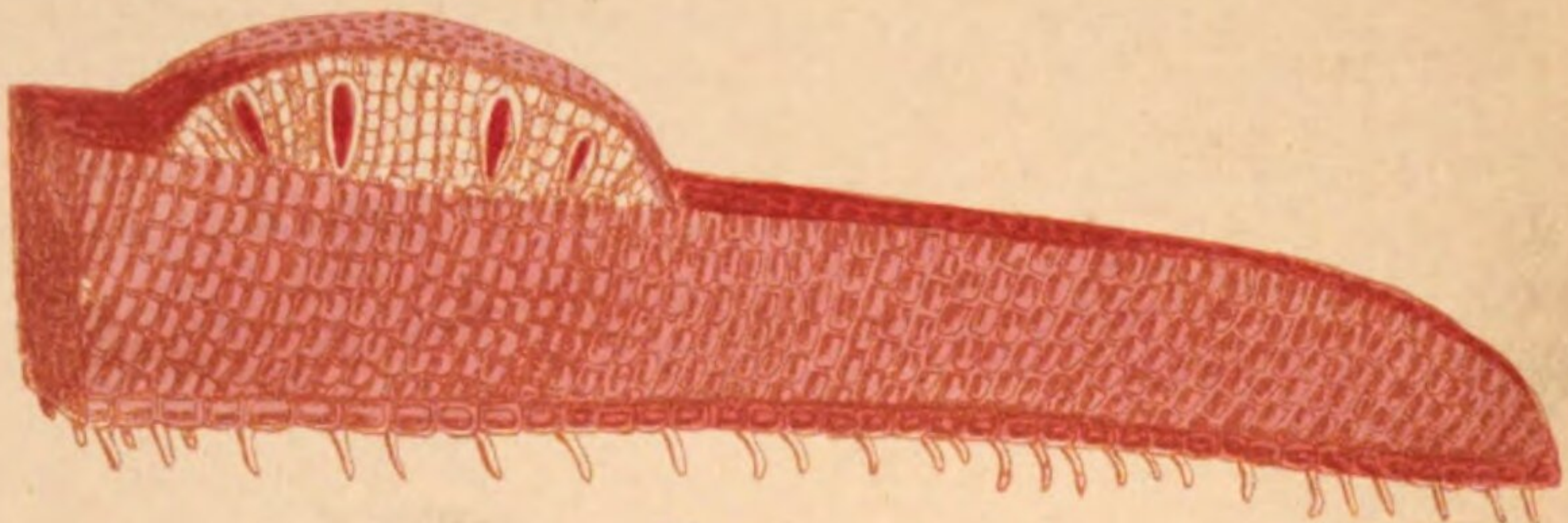


PLATE LXXI.

PEYSSONELIA DUBYI, *Crouan*.

GEN. CHAR. *Fronde*, brownish red, depressed, rooting by the under surface, concentrically zoned, composed of several rows of cellules, disposed obliquely in filamentous series. *Fructification*; warts scattered over the upper surface of the frond, formed of radiating filaments, and containing oblong, cruciately divided tetraspores. PEYSSONELIA (*Dne.*)—in honour of *J. A. Peyssonel*, an early and meritorious observer of marine plants, especially of Corallines.

PEYSSONELIA *Dubyi*; frond membranaceous, orbicular or lobed, attached by the whole of its under surface.

PEYSSONELIA *Dubyi*, *Crouan*, in *An. Sc. Nat.* 1844. p. 368. t. 11. B.

HAB. On old shells, stones, &c., in 10–15 fathoms water. Probably common on the British coasts. North of Ireland, *Mr. Thompson*. Birturbui Bay, on the Scallop bank, *Mr. Mc' Calla*. West of Scotland, *Rev. D. Landsborough*.

GEOGR. DISTR. Coast of Normandy, *Crouan*, (probably on all the Atlantic shores of Europe?).

DESCR. *Fronde*, from half an inch to an inch and a half in diameter, at first orbicular, in age becoming irregularly shaped, with a lobed or wavy margin, the lobes here and there overlapping each other, membranaceous, thin, concentrically zoned, attached by the whole of its under surface, by means of short, slender, colourless, rooting processes, which form a laxly disposed pubescence, extending over the lower surface. A vertical section of the frond exhibits a cellular structure, the cells arranged in ascending filamentous series, of which those near the centre of the frond are nearly vertical, and become more oblique as they approach the margin. *Fructification*, spongy warts, scattered over the upper surface, composed of pale filaments, similar except in colour, to those that compose the frond, among which are disposed vertical, elliptic-oblong tetraspores, the endochrome of which divides at maturity, by lines crossing at right angles, into four equal parts. *Colour*, a dull brownish red. *Substance* membranaceous.

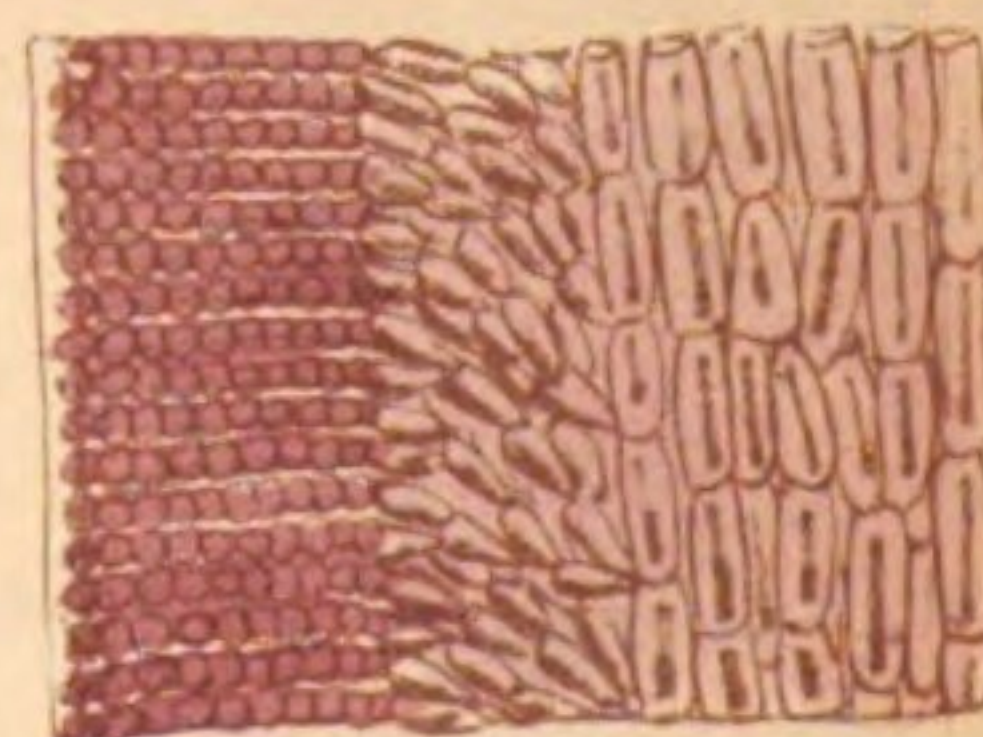
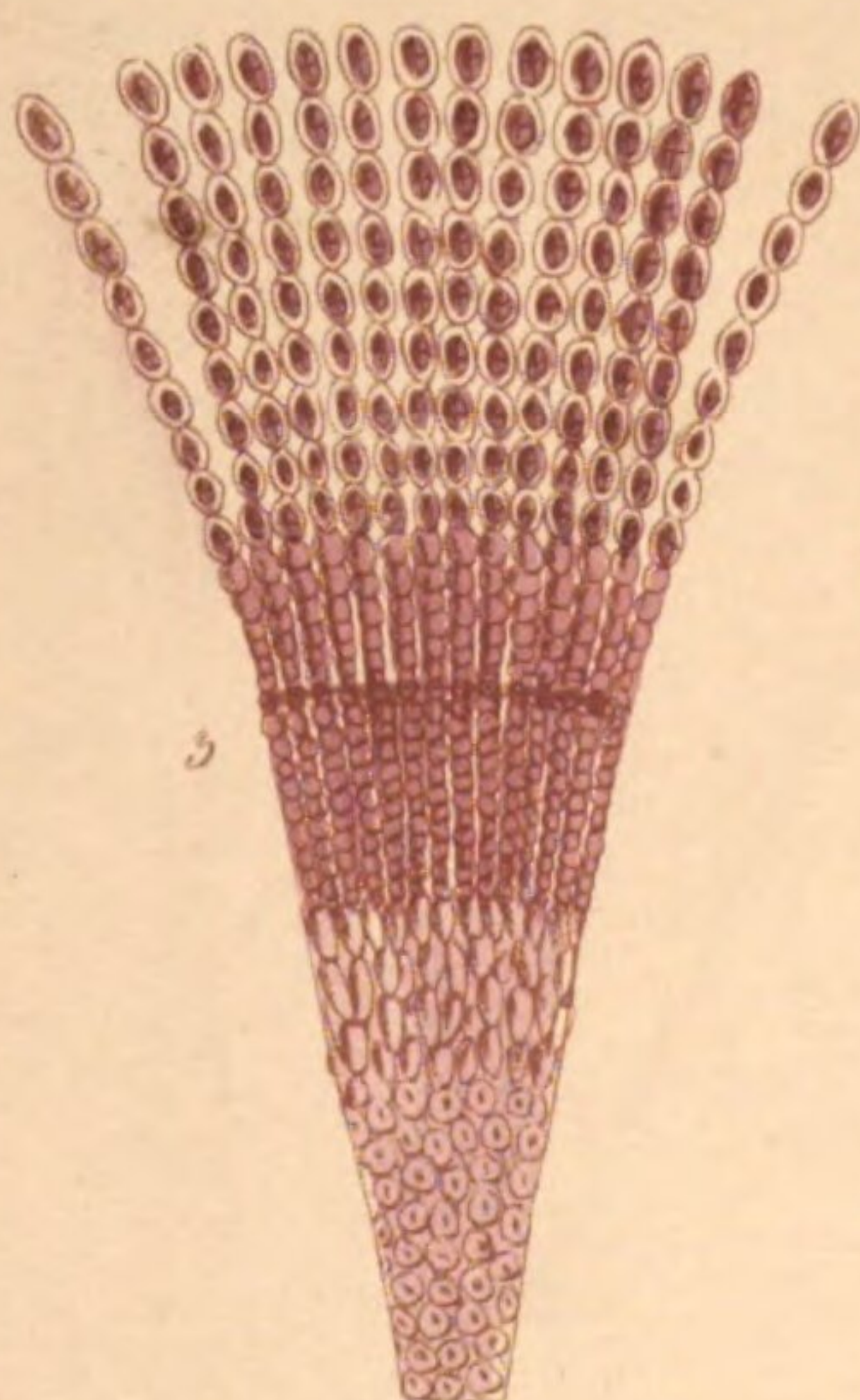
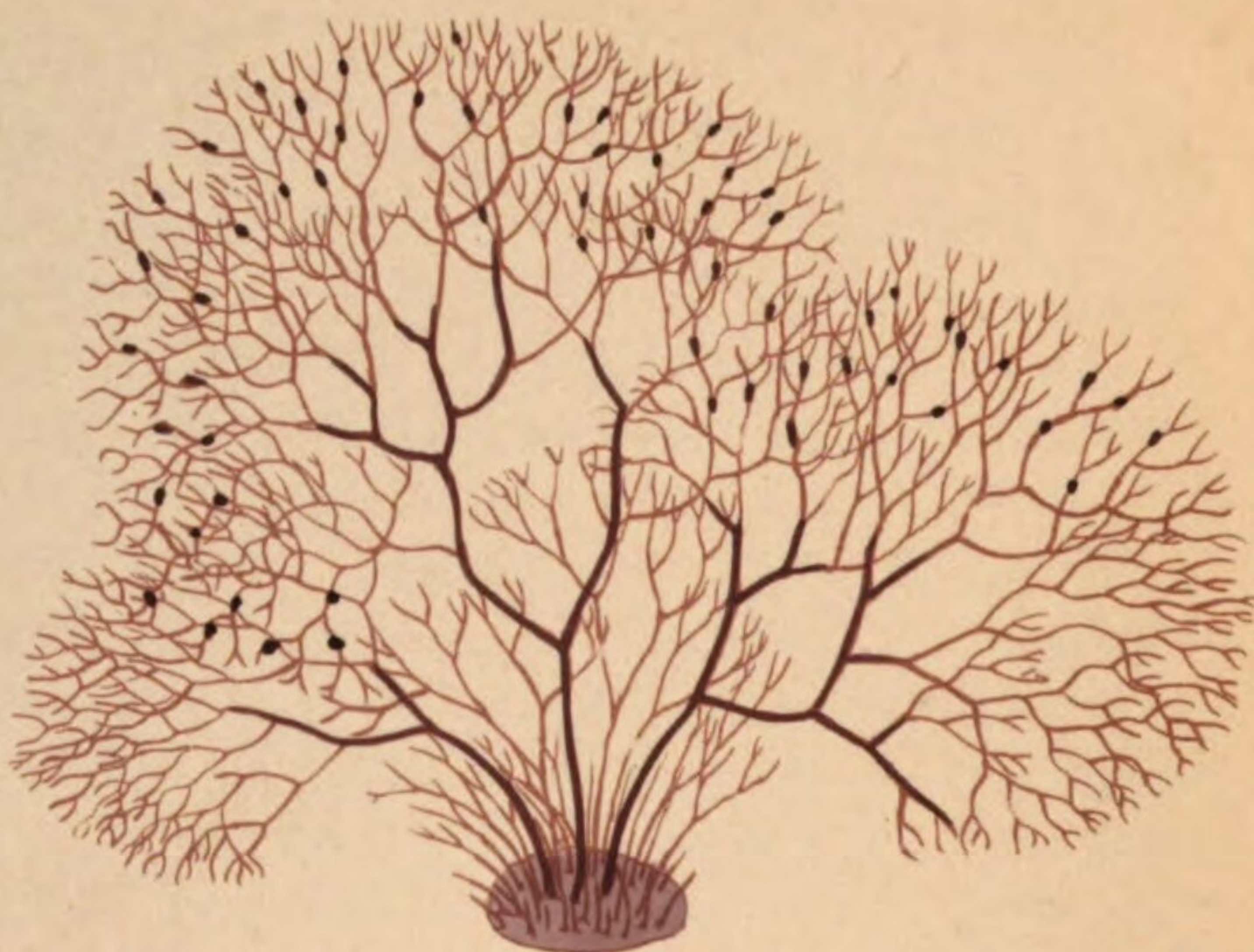
The species here figured is an instance among many that might be mentioned, of one of those obscure plants which escape the attention of collectors, but which, when once pointed out, are found to be very common, and even to have been noticed and neglected by many persons, long previously to their having been found by the individual who has rescued them from oblivion by giving them a name. To whom in such cases attaches the

merit of discovery? Certainly to the last observer. In the present instance the palm belongs to M. Crouan, unless the *P. orbicularis* of Kützing, described a short time previously, be a synonyme.

My first acquaintance with this plant was at Roundstone, last summer, where, while dredging in Birturbui Bay, Mr. Mc' Calla called my attention to specimens which came up abundantly in the dredge, attached to broken shells, stones, &c., and informed me that he had frequently observed the plant before. On examination with the microscope, I at once recognized them as belonging to *Peyssonelia*, and not being then aware of M. Crouan's memoir, I believed that I had alit upon an undescribed species, which I proposed to call *P. borealis*. On communicating the supposed discovery to Mr. Thompson, he sent me a specimen dredged in Strangford Lough so long ago as 1833, and which had lain in his cabinet unnamed. And still more recently, on communicating with Mr. Berkeley, that learned Cryptogamist referred me to M. Crouan's memoir, and favoured me with an authentic specimen of the French plant, which proves to be perfectly similar to our Irish specimens.

The genus *Peyssonelia* was founded by Decaisne, on the *Fucus squammarius*, Gm., a species common in the Mediterranean, of larger size, and more coriaceous texture than the present, and attached by a portion only of its lower surface. The *Zonaria rubra*, Grev., in Linn. Trans. is probably the young of that species. I am only acquainted with Kützing's *P. orbicularis* by the short description given in his work, by which it appears to be very closely allied to our *P. Dubyi*, but to differ in having its lower surface glabrous, and closely adherent.

Fig. 1. PEYSSONELIA Dubyi, growing on a dead shell of *Cytherea lincta*:—the natural size. 2. A vertical section of the frond, and of a wart. 3. Spores:—both magnified.



W. H. H. de laet del.

Reeve imp.

PLATE CVIII.

GYMNOGONGRUS GRIFFITHSIÆ, *Mart.*

GEN. CHAR. *Fronde* cylindrical, filiform, horny, much branched; its substance composed of densely packed filaments, of which the innermost are longitudinal, the middle curving outwards, and the external stratum (or periphery) horizontal and moniliform. *Fructification*; naked warts entirely composed of strings of cruciate tetraspores. GYMNOGONGRUS (*Mart.*)—from *γυμνος*, *naked*, and *γογγυπος*, a word applied by Theophrastus to a disease resembling a swelling, to which trees are subject; the allusion is to the appearance of the fruit in these Algæ.

GYMNOGONGRUS *Griffithsiæ*; frond filiform, flexuous, cartilaginous, stipitate, many times dichotomous, the apices fastigate, forked; warts of fructification oblong, at length surrounding the stem.

GYMNOGONGRUS *Griffithsiæ*, *Mart. Fl. Braz.* vol. i. p. 27. *Mont. Fl. Algier.* p. 119.

TYLOCARPUS *Griffithsiæ*, *Kütz. Phyc. Gen.* p. 411.

TYLOCARPUS *tentaculatus* (?) *Kütz. l. c. t.* 70. f. 2.

CHONDRUS *Griffithsiæ*, *J. Ag. Alg. Medit.* p. 95. *Endl. 3rd Suppl.* p. 39.

GIGARTINA *Griffithsiæ*. *Lamour. Ess.* p. 49. *Lynbg. Hyd. Dan.* p. 43. t. 11. *Grev. Alg. Brit.* p. 149. *Hook. Br. Fl.* vol. ii. p. 301. *Harv. in Mack. Fl. Hib.* part 3. p. 201. *Harv. Man.* p. 76. *Wyatt, Alg. Danm.* no. 28. *Mont. Fl. Canar.* p. 160.

POLYIDES *Griffithsiæ*, *Gaill. Dict. Sc. Nat.* vol. 53. p. 365.

SPHÆROCOCCUS *Griffithsiæ*, *Ag. Sp. Alg.* vol. i. p. 316. *Ag. Syst.* p. 235. *Spreng. Syst. Veg.* vol. iv. p. 339.

FUCUS *Griffithsiæ*, *Turn. Hist.* t. 37. *E. Bot.* t. 1926.

HAB. On submarine rocks, near low-water mark. Perennial. Autumn and Winter. Sidmouth and Torquay, *Mrs. Griffiths*. Exmouth, *Miss Filmore*. Bantry Bay, *Miss Hutchins*. Balbriggan, *Dr. Scott*. Mounts Bay, *Mr. Ralfs*. Odin's Bay, Stronsa, *Lieut. F. W. L. Thomas*, and *Dr. Mc'Bain*. Malahide, *Mr. Mc'Calla*.

GEOGR. DISTR. Coasts of Europe, from Norway to Spain, Mediterranean Sea. Canary Islands. Boston, North America, *Mr. Emerson*.

DESCR. *Root* a disc-like expansion, spreading on the surface of the rock. *Fronde* densely tufted, one to three inches high, rather thicker than hog's bristle, simple at base, for a short distance, then forked and afterwards closely and repeatedly dichotomous, or trichotomous, with more or less regularity. Sometimes the upper branches which have received an injury, produce dense bunches of branchlets without order, but these in their divisions soon assume the forked character of the species. *Branches* flexuous, erectopatent, with rounded axils, and more or less strictly fastigate apices; every

part cylindrical, except the apices, which are sometimes more or less compressed. Warts of fructification formed in various parts of the stem and branches, without order, at first appearing at one side of the branch, but soon extending round it, wholly formed of radiating moniliform filaments, whose upper joints are gradually transformed into elliptical, cruciate tetraspores. *Substance* cartilaginous, or somewhat horny. *Colour* varying from a brown-red to a blackish-purple.

Though hitherto placed, in British works, in the genus *Gigartina*, the structure of this plant is much more similar to that of *Chondrus*, in which genus it is placed by Professor J. Agardh. The structure, however, though, similar, is not identical; and as the tetrasporic fructification, which alone is known to us, offers some peculiarities, I adopt the name invented by Von Martius for this and the nearly allied *G. plicata*. The fructification is a most beautiful microscopic object, to which our figure does scanty justice. The exquisite symmetry of the strings of tetraspores, each marked with a white cross, and each inclosed in its glossy pellicle and brilliant as a ruby, can be but imperfectly shown on paper.

Gymnogongrus Griffithsiæ, was first correctly distinguished by Mrs. Griffiths, whose name it worthily bears. It may at once be known from *G. plicatus* by the different habit, the more regular dichotomous branching, the fastigate apices, and the substance, which is far less tough and horny. Agardh at one time confounded it with *Gigartina acicularis*, a plant of widely different structure. Its geographical range is extensive, though not quite so great as that of *G. plicatus*. It is dispersed on most of the Atlantic shores, from a high northern latitude to the tropics, but has not yet been found in the Southern Ocean, where *G. plicatus* occurs. It generally occurs within tide marks.

Fig. GYMNOGONGRUS GRIFFITHSIÆ :—*of the natural size.* 2. Apex of a branch. 3. Transverse section of the frond, cutting through a wart. 4. One of the strings of tetraspores. 5. Longitudinal section of the frond :—*all more or less magnified.*



1.

2.

3.

4.

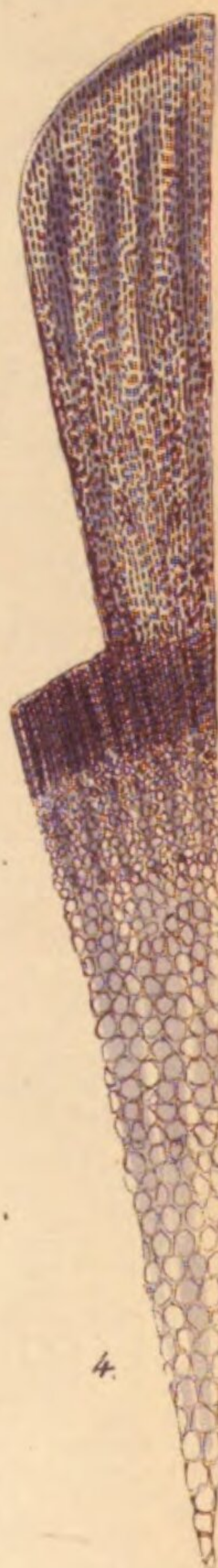


PLATE CCLXXXVIII.

GYMNOGONGRUS PLICATUS, Kg.

GEN. CHAR. *Fronde* cylindrical or compressed, horny, much branched, its substance composed of densely packed filaments, of which the innermost are longitudinal, the middle curving outwards, and the external stratum (or periphery) horizontal and moniliform. *Fructification*, naked warts entirely composed of bead-like strings of cruciate tetraspores. GYMNOGONGRUS (*Mart.*),—from γυμνος, naked, and γογγυρος, a word applied by Theophrastus to wart-like excrescences on trees.

GYMNOGONGRUS *plicatus*; frond horny, cylindrical, filiform, very irregularly branched, entangled, wiry; branches sub-dichotomous; axils obtuse; ramuli often secund; fructification, oblong warts composed of obscurely-jointed filaments.

GYMNOGONGRUS *plicatus*, Kütz. *Sp. Alg.* p. 789. *Harv. Man.* ed. 2. p. 145.

GIGARTINA *plicata*, Lamour. *Ess.* p. 48. *Lyngb. Hyd. Dan.* p. 42. *Grev. Alg. Brit.* p. 150. *Hook. Br. Fl.* vol. ii. p. 301. *Wyatt, Alg. Danm.* No. 116.

Harv. in Mack. Fl. Hib. part iii. p. 201. *Harv. Man.* p. 76.

SPHÆROCOCCLUS *plicatus*, Ag. *Sp. Alg.* vol. i. p. 313. *Syst.* p. 234.

TYLOCARPUS *plicatus*, Kg. *Phyc. Gen.* p. 411.

FUCUS *plicatus*, Huds. *Fl. Ang.* vol. ii. p. 589. *Stack. Ner. Brit.* p. 23. t. 7. *Turn. Syn. Fuc.* p. 323. *Hist.* t. 180. *E. Bot.* t. 1089. *Fl. Dan.* t. 408.

SCYTOSIPHON *hippuroides*, *Lyngb. Hyd. Dan.* p. 63. t. 14.

HAB. On rocks and stones within tide-marks, and at a greater depth. Perennial. Common.

GEOGR. DISTR. Atlantic shores of Europe and America. New Holland, Mr. Brown. Southern Ocean, at Kerguelen's Land, Dr. Hooker.

DESCR. *Fronde* densely tufted, and often much entangled together, from six to ten inches long or more, filiform, of equal diameter throughout, as thick as hogs' bristles, or somewhat thicker, shrinking in drying, very rigid, wiry, and tenacious, much branched. *Branches* flexuous, very irregular in position and division; sometimes scattered, and sometimes densely aggregated; often secund, rarely opposite, frequently dichotomous; of various lengths, so that the tufts are never fastigate. The axils of the forkings are distinctly rounded, and the apices of the branches are all blunt. *Fructification*, wart-like excrescences of irregular form, scattered variously over the branches. I have not seen any *tetraspores* in the specimens examined. The whole substance of the wart consists of very slender, densely packed filaments. *Colour*, a dark lurid purple, fading to greenish, and even to yellow and white. The surface is singularly smooth and glossy. In drying, this plant does not adhere to paper.

There is a peculiar rigidity and wiryness in the frond of this plant, which at once distinguishes it from any other British Alga with which it can be confounded: and, when dry, the glossy surface is equally striking. It often occurs in large bundles, very much tangled together, and then looks like a mass of rigid dark-purple bristles.

I have never seen fruit perfectly ripe on any specimens that I have examined. The wart-like receptacles of fruit are common enough, but they seem to come to perfection but seldom. This is very different from the habit of *G. Griffithsiæ*, in whose *gongri* tetraspores are always found, and are some of the most beautiful of marine microscopic objects.

G. plicatus, in its geographical distribution, is almost a cosmopolite.

Fig. 1. GYMNOGONGRUS PLICATUS:—*the natural size*. 2. Magnified portion of a branch, bearing tubercles. 3. Transverse section of branch and tubercle. 4. A small segment of the same:—*more highly magnified*.



PLATE XCV.

POLYIDES ROTUNDUS, Grev.

GEN. CHAR. *Root* an expanded disc. *Fron*d cylindrical, dichotomous, cartilaginous, solid, the axis consisting of densely packed, longitudinal, interlacing and anastomosing filaments; the *periphery* of coloured, horizontal, dichotomous filaments, whose lower half is composed of large, elliptical cells; their upper of much smaller, submoniliform cellules. *Fructification*, of two kinds, on distinct individuals; 1, oblong, irregularly formed, external *warts*, composed of dichotomous filaments, through which are scattered elliptical *favellæ*, having a broad pellucid limbus. 2, cruciate *tetraspores* immersed, at intervals, among the filaments of the periphery. POLYIDES (*Ag.*),—from πολυ, *many*, and ἰδέα, *form or appearance*; a name ill applied to the present genus.

POLYIDES rotundus.

POLYIDES rotundus, Grev. *Alg. Brit.* p. 70. t. 11. Hook. *Brit. Fl.* vol. ii. p. 284. Wyatt, *Alg. Danm.* no. 161. Harv. in Mack. *Fl. Hib.* part 3. p. 190. Harv. *Man.* p. 43.

POLYIDES lumbricalis, *Ag. Sp. Alg.* vol. ii. p. 392. *Ag. Syst. Alg.* p. 194. Spreng. *Syst. Veg.* vol. iv. p. 344. Endl. *3rd Suppl.* p. 38.

SPONGIOCARPUS rotundus, Grev. *Fl. Edin.* p. 286.

FURCELLARIA rotunda, Lyngb. *Hyd. Dan.* p. 49.

FURCELLARIA lumbricalis, Kütz. *Phyc. Gen.* p. 402. t. 72.

CHORDARIA rotunda, Hook. *Fl. Scot.* part 2. p. 97.

GIGARTINA rotunda, Lamour. *Ess.* p. 49.

FUCUS rotundus, Gm. *Hist.* p. 110. t. 6. f. 3. (excl. syn. Huds. and Raii.) Linn. *Syst. Nat. Gm.* p. 1383. With. vol. iv. p. 110. Turn. *Syn. Fuc.* vol. ii. p. 309. Turn. *Hist.* t. 5. E. Bot. t. 1738.

FUCUS radiatus, Good. and Woodw. in Linn. *Trans.* vol. iii. p. 202. Stack. *Ner. Brit.* p. 89. t. 14.

FUCUS caprinus, Gunn. *Fl. Norv.* vol. i. p. 96.

FUCUS fastigiatus, Herb. Linn. (sec. Turn.) *Esper*, t. 16 (excl. syn.).

HAB. On rocks in pools, within the tide range. Perennial. Winter. Frequent on the shores of England and Ireland. Jersey, Miss White and Miss Turner. Rare in Scotland? Appin, Capt. Carmichael. Dumfries, Sir J. Richardson. Frith of Forth, Mr. Maughan, Mr. Stewart, Dr. Greville. Aberdeen, Dr. Dickie. Orkney, Rev. Mr. Clouston, Rev. Mr. Pollexfen, Lieut. Thomas, Dr. Mc'Bain. Ardrossan, Major Martin, and Rev. D. Landsborough.

GEOGR. DISTR. Atlantic shores of Europe from Iceland to France (and Spain?). Atlantic shores of North America. Boston, Mr. Emerson. New York, Prof. Bailey. Adriatic Sea, Wulfen (omitted by J. Agardh).

DESCR. Root a fleshy, flattened, circular disc, half an inch or more in diameter.

Fronds densely tufted, from four to eight inches high, as thick as a crow's quill, cylindrical, rising with a simple stem from one to three inches in length, then forked, and afterwards repeatedly and closely dichotomous; the axils rounded. *Apices* of equal length. *Fructification*, of two kinds on distinct plants; 1, fleshy warts of a pale pinky colour, from a quarter to half an inch in length, bursting out irregularly from various parts of the branches, composed of vertical, dichotomous, moniliform, slender filaments, among which are thickly scattered large, oval *favellæ*, containing a densely compacted cluster of conical spores. 2, oblong *tetraspores*, divided cross-wise, scattered at intervals among the filaments of the periphery of the frond, through all the upper branches of plants which produce them, vertical, deeply sunk. *Colour* a dark brownish red. *Substance* cartilaginous.

The genus *Polyides* is remarkable for its singular fructification, which strikingly differs both in appearance and structure from that of any other of the *Rhodospermeæ*. In appearance the conceptacular fruit most nearly resembles what are called *nemathecia*, but the distinct and isolated *favellæ* which it contains are very different from the contents of those imperfectly organized excrescences. Here, in what look like irregular warts, we have most perfectly formed and symmetrically arranged spores. The *tetraspores*, which are now, I believe, described for the first time, were discovered by Mrs. Griffiths, whose researches into the fructification of the Algæ are beyond all praise, and to her I am indebted for specimens, producing this description of fruit. It is found in winter, but on plants which do not form warts.

Polyides rotundus has a wide range in the northern hemisphere, being found through most of the cold and temperate latitudes of the Atlantic. It is perhaps the only species of the genus; the *P. D'Urvillæi* of Bory being a doubtful species, very possibly not a congener.

I follow Greville in retaining the specific name adopted in the great work of Turner, the foundation of modern Phycology, in place of that selected by Agardh from Bauhin's '*Pinax*', though to the latter the mere priority may belong. The truth is, that the strong resemblance between *Polyides rotundus* and *Furcellaria fastigiata* (*Fucus lumbricalis*, Gm.), has caused their synonymy to be so confused in the works of early writers, that it is a question to which of them Bauhin applied the name *lumbricalis*. Even Linnæus confounded one with the other.

Fig. 1. POLYIDES ROTUNDUS:—of the natural size. 2. Transverse section of the frond, and of a wart. 3. A favella. 4. A spore from the same. 5. One of the filaments of which the wart is composed. 6. Transverse section of a frond, with *tetraspores*. 7. Tetraspores:—all more or less highly magnified.

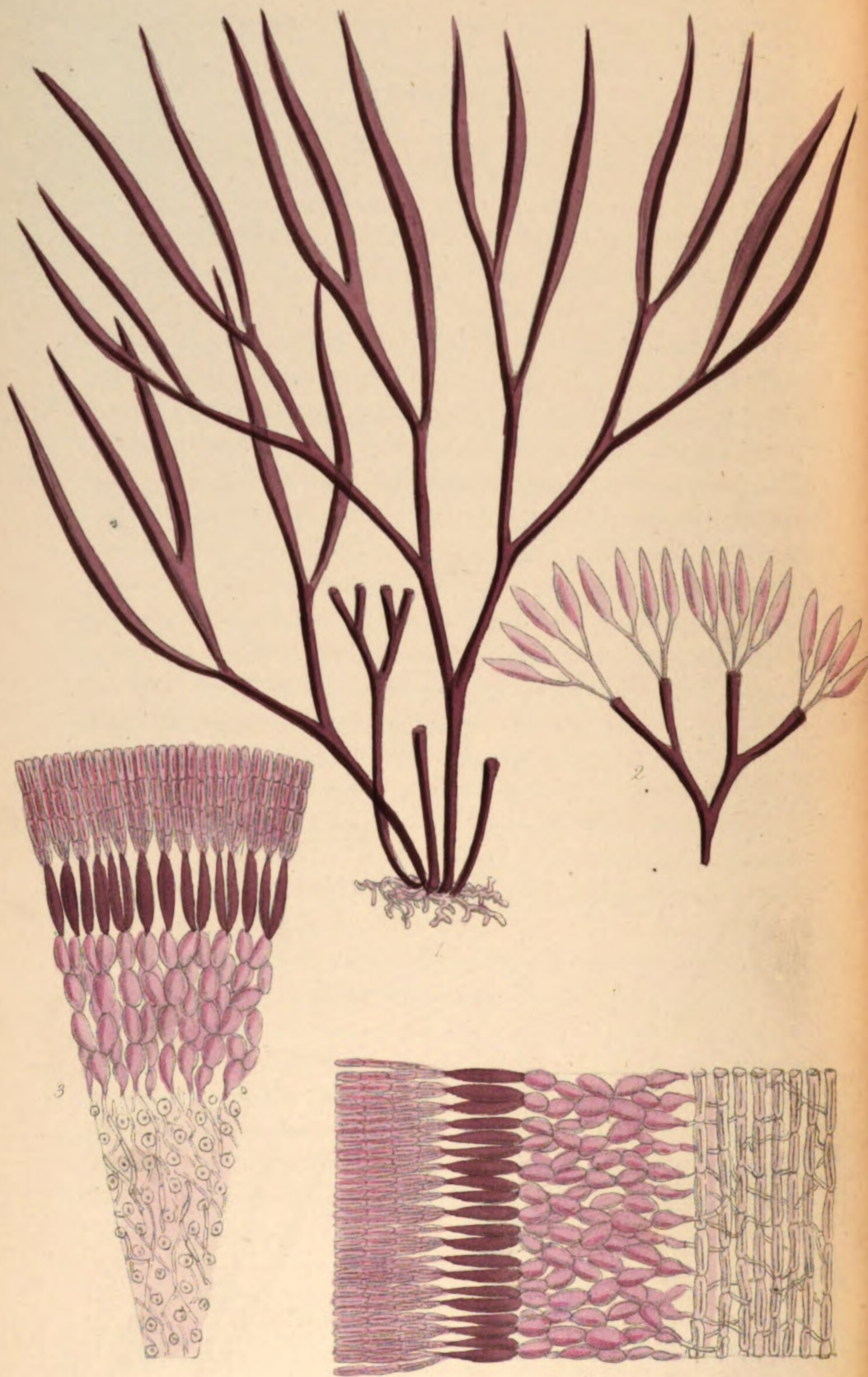


PLATE XCIV.

FURCELLARIA FASTIGIATA, *Lamour.*

GEN. CHAR. *Root* branching. *Frond* cylindrical, dichotomous, cartilaginous, solid; the *axis* consisting of densely packed, longitudinal, interlacing and anastomosing filaments; the *periphery* of coloured, horizontal, dichotomous filaments, issuing from those of the axis, whose lower half is composed of large, elliptical cells; their apices of much smaller cylindrical cellules. *Fructification*, "terminal, elongated, pod-like receptacles, containing a stratum of dark, oblong, pear-shaped spores in the circumference" (Grev.). FURCELLARIA (*Lamour.*),—from *furcula* or *furcilla*, a little fork; alluding to the forked frond.

FURCELLARIA fastigiata.

FURCELLARIA fastigiata, *Lamour. Ess.* p. 26. *Ag. Sp. Alg.* vol. i. p. 103. *Ag. Syst.* p. 274. *Grev. Fl. Edin.* p. 286. *Grev. Alg. Brit.* p. 67. t. 11. *Hook. Brit. Fl.* vol. ii. p. 283. *Wyatt, Alg. Danm.* no. 106. *Harv. in Mack. Fl. Hib.* part 3. p. 190. *Harv. Man.* p. 54. *Endl. 3rd Suppl.* p. 38. *Kütz. Phyc. Gen.* p. 402. t. 71.

FURCELLARIA lumbricalis, *Lamour. Ess.* p. 26. *Lyngb. Hyd. Dan.* p. 48. t. 40. *Hook. Fl. Scot.* part 2. p. 97. *Spreng. Syst. Veg.* vol. iv. p. 315.

FUCUS fastigiatus, *Huds. Fl. Ang.* p. 588. *Lightf. Fl. Scot.* p. 930. *Gm. Hist.* p. 108. t. 6. f. 1. *Good. and Woodw. in Linn. Trans.* vol. iii. p. 199. *Stack. Ner. Brit.* t. 6 and 14. *Fl. Dan.* t. 393.

FUCUS lumbricalis, *Gm. Hist.* p. 108. t. 6. f. 2. *Good. and Woodw. in Linn. Trans.* vol. iii. p. 204. *Turn. Syn.* p. 317. *Hist.* t. 6. *E. Bot.* t. 824.

FUCUS furcellatus, *Linn. Sp. Pl.* p. 1631. *Huds. Fl. Ang.* p. 589.

HAB. On submarine rocks, within tide marks, generally growing in tidal pools. Perennial. Winter. Common on the shores of the British Islands.

GEOGR. DISTR. Northern Ocean. Atlantic shores of Europe, and of North America.

DESCR. *Root* composed of entangled, branching fibres. *Fronds* densely tufted, from four to eight inches in height, half a line to a line in diameter, filiform, cylindrical, rising with a simple stem for two to three inches, forked, and afterwards repeatedly dichotomous, with acute angles; all the tops of equal length. The tips of the branches are either much lengthened into what appear like lanceolate receptacles or pods, simple or forked, one to two inches long, and tapering to a fine point, which fall away at maturity; or, on different individuals, the truncated apices produce by a second growth, slender, forked ramuli, terminating in ovate, pale-coloured pod-like bodies, half an inch in length, and either simple or forked. The elongated pod-like apices are usually regarded as the fructification, and their falling away at stated periods favours the conjecture; but their structure is similar to that of other parts of the frond, except that the stratum of elongated concentric dark-coloured cells, which are usually regarded as the spores, and

which exist in all parts of the frond, are rather more developed. These are, however, very unlike *tetraspores*. Colour dark brownish red. Substance cartilaginous.

There is such a strong external resemblance between the subject of this plate, and that of the following one (*Polyides rotundus*), that they are often mistaken one for the other, and without contrasting the fibrous root of the former, with the large scutate base of the latter, it might, in some instances, be difficult to discriminate between them. There is, indeed, some difference in the structure of the frond, but not of a very striking character, and though easily observed when slices of both are seen together under the microscope, most difficult of being defined in intelligible words. And yet, with this resemblance in general appearance, all modern authors, with the exception of Kützing, place them in different genera; and, until very lately, even in different families. This opinion of botanists is grounded on a great difference observed between the fructification of these plants; and is probably correct. But the fructification of *Furcellaria* is very imperfectly known, or if known, is of such an anomalous character that it is difficult to build upon it. The pod-like elongations of the branches, which are produced in winter, and drop off as the season advances, do indeed appear like fructification, and are so described by authors. But their structure is widely different from that of the fruit of other *Rhodosperms*; and if they be entitled to the name of fruit, it must be of the conceptacular kind, for the spores which they contain in no respect resemble tetraspores. If my dissections be correct, they differ from other cellules only by being of a darker colour. They occupy no isolated portion of the frond, but are found, though of smaller size, in all its parts, extending in a stratum between the external and internal filaments of the periphery, between which they are the connecting links; being attached to both by one or other extremity. I shall be very glad of further information on the fructification of this plant, should any observer have detected *tetraspores*.

Fig. 1. *FURCELLARIA FASTIGIATA*. 2. Portion of a frond with inflated tips:—both of the natural size. 3. A transverse, and 4, a longitudinal section of a "receptacle":—both highly magnified.



PLATE LIX.

DUMONTIA FILIFORMIS, *Grev.*

GEN. CHAR. *Frond* cylindrical, membranaceous, filled with watery gelatine, tubular; its walls composed externally of minute roundish cells, internally of elongated cellules, disposed in filaments. *Fructification* of two kinds, on distinct individuals; 1, roundish *tetraspores* immersed in the surface cellules; 2, clusters of obovate *spores* attached to the inner surface of the membrane of the frond. DUMONTIA (*Lamour.*)—in honour of *M. Dumont*, a French naturalist.

DUMONTIA *filiformis*; frond undivided, attenuated to each extremity, pinnated with long, simple, tapering branches.

DUMONTIA *filiformis*, *Grev. Alg. Brit.* p. 165. t. xvii. *Hook. Br. Fl.* vol. ii. p. 308. *Wyatt, Alg. Danm.* no. 31. *Harv. in Mack. Fl. Hib.* part 3. p. 188. *Harv. Man.* p. 51. *Hook. fil. Fl. Ant.* part i. p. 189. *Kütz. Phyc. Gen.* p. 394. t. 74. f. 2. *Endl. 3rd Suppl.* p. 39.

DUMONTIA *incrassata*, *Lam. Ess.* p. 45.

HALYMENIA *filiformis*, *Ag. Sp. Alg.* vol. i. p. 214. *Syst.* p. 245.

CHONDRIA *purpurascens*, *Grev. Fl. Edin.* p. 290.

GASTRIDIDIUM *filiforme*, *Lyngb. Hyd. Dan.* p. 68. t. 17.

CONFERVA *filiformis*, *Fl. Dan.* t. 1480. f. 2.

ULVA *filiformis*, *Wahl. Fl. Lapp.* p. 508.

Var. *β. crispata*; frond broad, compressed, waved, curled and twisted.

DUMONTIA *filiformis β. crispata*, *Grev. Alg. Brit.* p. 165. *Harv. l. c.*

HALYMENIA *purpurascens β. crispata*, *Grev. Crypt.* t. 240.

HAB. On rocks and stones in the sea, at half-tide level. Annual. Summer. *β.* in places exposed to tidal currents. Common.

GEOGR. DISTR. Shores of Europe. Southern Ocean.

DESCR. *Root*, a small disc. *Fronds* solitary or tufted, from one to twenty inches in length, and from a tenth of an inch to half an inch in width, cylindrical or compressed, tubular, with an undivided stem furnished with alternate or irregularly disposed, lateral, simple branches; both stem and branches tapering at the base, and much attenuated towards the extremities, more or less waved, and flexuous. Sometimes the main stem is short, and comparatively slender; the branches being much longer, and of greater diameter: sometimes the branches are short, and the stem long. In almost all cases the tube is unequally distended or wavy, a peculiarity which in var. *β.* is very much exaggerated. In this the frond is much twisted, often in a strong spiral, and the membrane excessively curled and puckered. *Fructification*; 1, *tetraspores* (which I have not seen); and clusters of obovate *spores* attached to the inner surface of the tube, abundantly produced in summer. *Substance* membranaceous, gelatinous within, adhering to paper in drying.

The *colour* varies from pale yellowish, in shallow water, to various degrees of livid purple, in deeper and more shaded situations. In fresh water the plant soon decomposes, giving out a pinkish dye of some brilliancy.

A very common plant, and one which, though tolerably constant to a particular ramification, having long simple branches springing from a simple stem, is yet subject to many modifying causes, which affect its habit, and general appearance very considerably. The variety β , an excellent figure of which is given by Dr. Greville, in his 'Crypt. Flora,' differs extremely from the normal form, represented in our plate. In it, the frond is often an inch in diameter, and so much puckered and waved, that, except in colour, it strongly resembles *Enteromorpha intestinalis*. Yet this variation appears to arise solely from locality, being always found where a strong stream rolls down.

Dumontia filiformis is widely dispersed in the temperate zones, and was found by Dr. Hooker, both in the Auckland group of Islands, and at the Falklands. Throughout Europe it is extremely common. There are several other species of the genus, many of which are found in the Kamtschatkan seas, and along the opposite coast of America. One of them, *D. saccata*, which has a simple, bag-like frond, is found, if all the plants which go under this name belong to one species, in localities nearly as widely apart as is *D. filiformis*, occurring on the west coast of America, and at the Cape of Good Hope. Another species, *D. prismatica*, J. Ag., inhabits the Indian Ocean. But the generic characters of several of the reputed species, require examination, and, probably, many will eventually be removed to new genera.

The *Dumontiæ* are the most simple in structure of the *Gastereocarpeæ*, in which they represent such plants as *Enteromorpha*, *Asperococcus*, &c. They are also found at a higher level than any others of their family, some of them growing, as our common one occasionally does, nearly at high water mark.

Kützing figures and describes *tetraspores* on this species, but I have not had the good fortune to find them. The clustered spores are common.

Fig. 1. DUMONTIA FILIFORMIS :—*natural size*. 2. Portion of the frond, showing a front view of a cluster of spores, attached to the inner surface. 3. Lateral view of the same cluster, and vertical section of the wall of the frond :—*magnified*.

A.



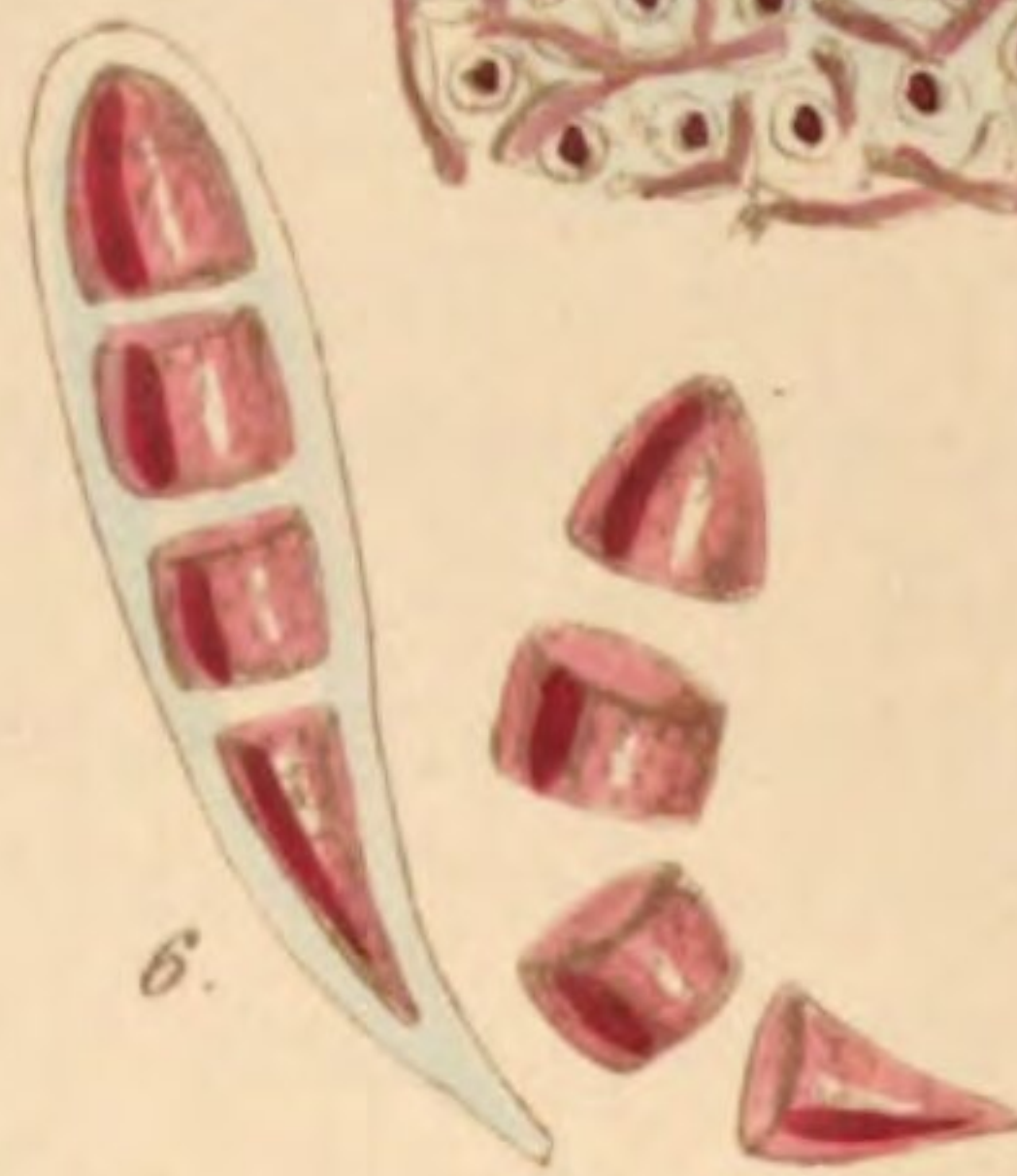
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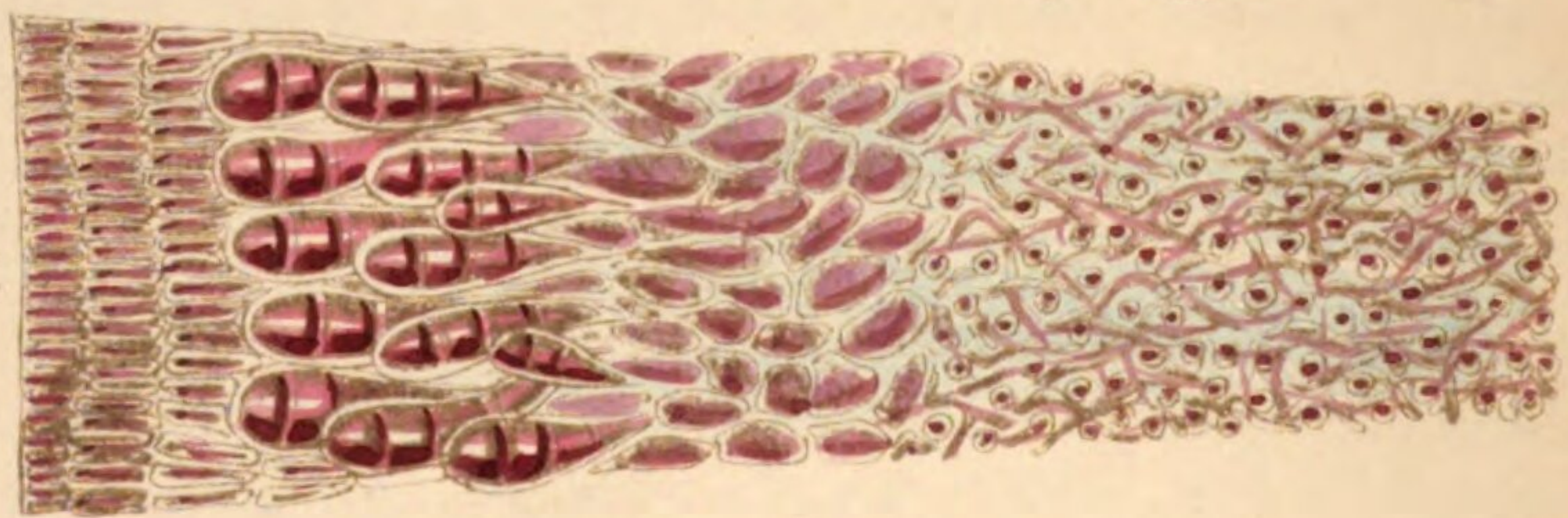
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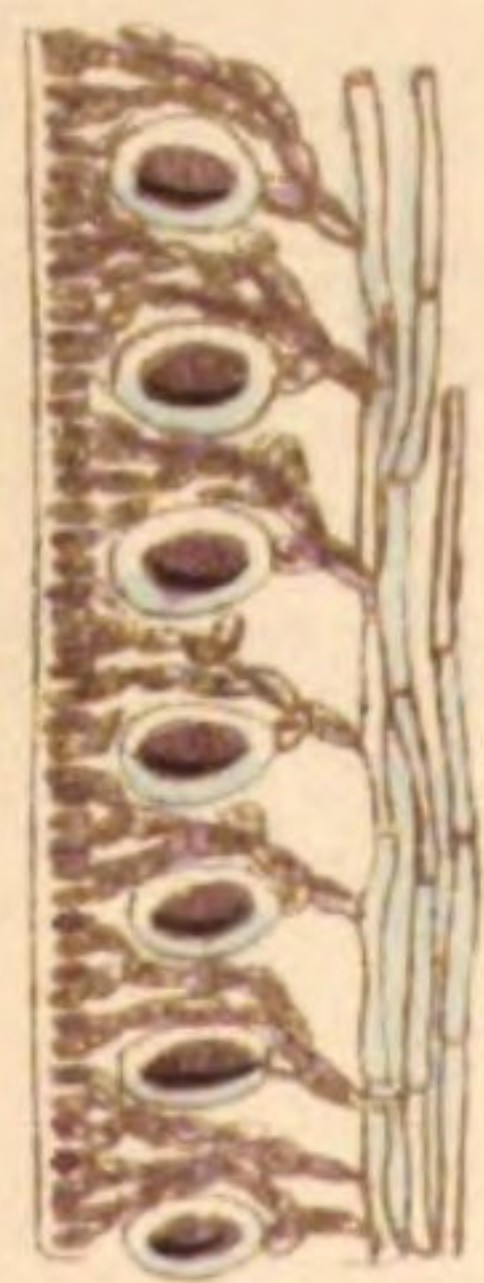


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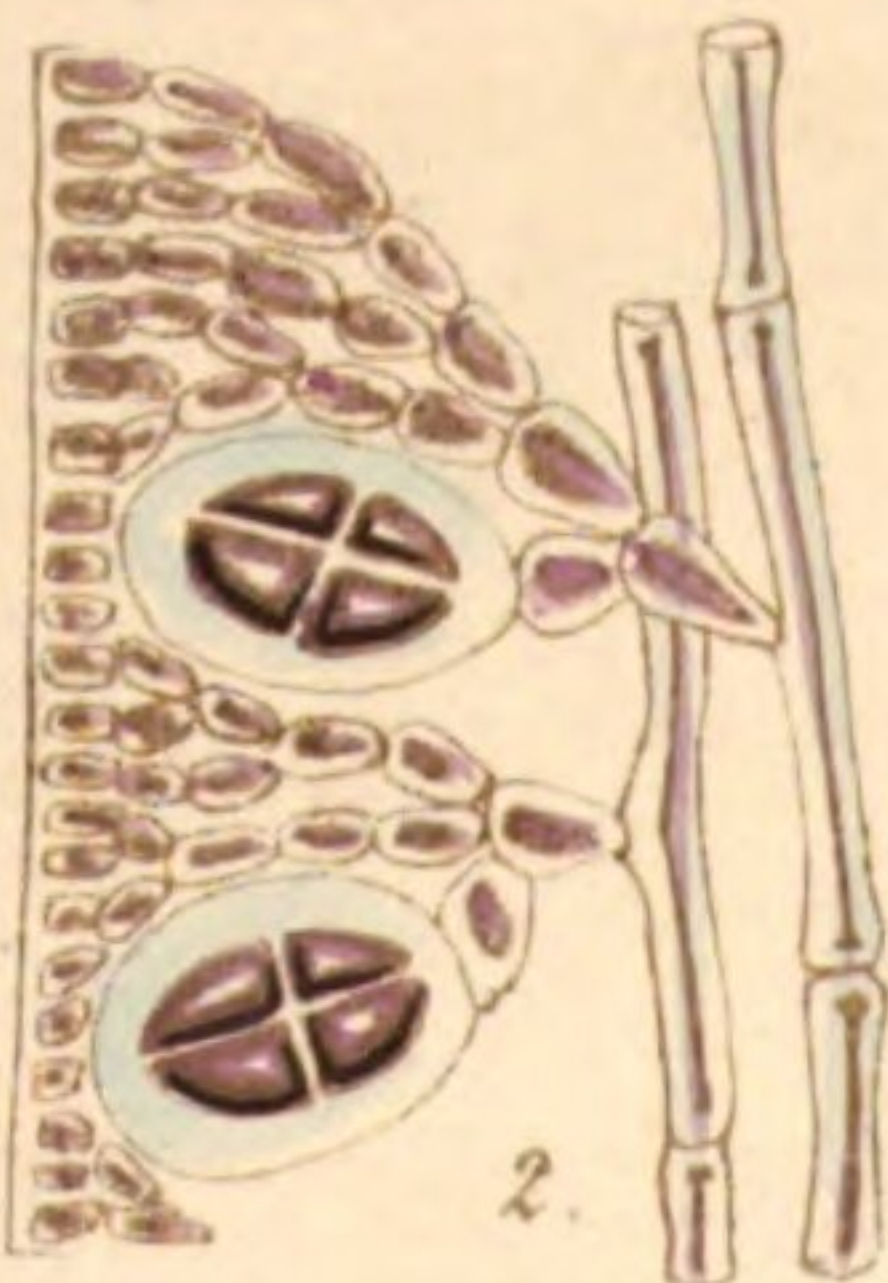


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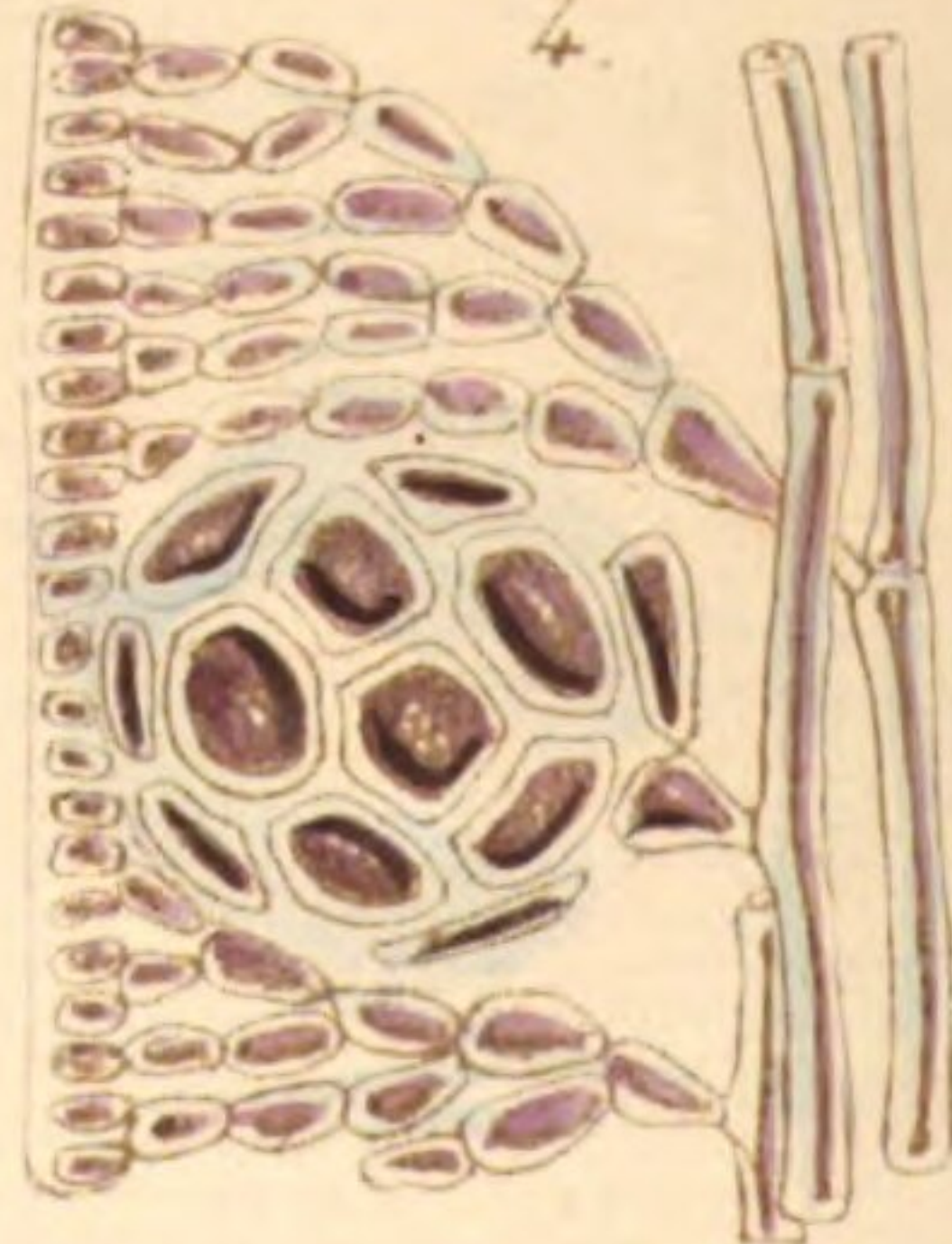
1.



2.



4.



3.



PLATE CCCLVII. *A.*FURCELLARIA FASTIGIATA, *Lamour.*

(For description, &c., see PLATE XCIV.)

My remarks appended to Pl. XCIV. had scarcely been made public when I received from Mrs. Griffiths specimens of *F. fastigiata* in both kinds of fruit, which I regret had not reached my hands in time to withhold both that plate, of which the analytic figures 3 and 4 are incorrect, and the remarks appended to it, so far as they refer to the fructification.

Dr. Caspary has given, in the *Annals of Natural History* (Second Series, vol. vi. p. 87), a minute account of the comparative structure of *Furcellaria* and *Polyides*, with micrometric measurements of the cells composing the various strata of their fronds; but it is due to Mrs. Griffiths to state that she has long been perfectly well acquainted with the fructification of *Furcellaria*, figures of which I now give in detail.

Fig. 1 represents a cross section of one of the pod-like branches, of which fig. 2 is a longitudinal cutting. Fig. 1 shows five *favellæ* formed from the large cells immediately in contact with the fibro-cellular axis. In fig. 2, two of these *favellæ* are shown, prolonged by several superimposed *favellæ* having become confluent, as is almost always the case in fully ripe specimens. Fig. 3 is a small transverse slice, to show the cells more highly magnified; fig. 4 represents some spores separated. Fig. 5 is a transverse segment of a frond producing *tetraspores*, which are formed in several rows (according to age) from the cells of the middle stratum most distant from the axis. These *tetraspores* (fig. 6) are pear-shaped and transversely zoned.

I am indebted to Mrs. Griffiths for numerous and beautiful specimens of both kinds of fruit in the most perfect state.

PLATE CCCLVII. B.

DUMONTIA FILIFORMIS, Grev.

(See description under PLATE LIX.)

The analysis in Pl. LIX. fig. 2 and 3, and the generic character, are both faulty. It is hoped that the figures now given will show the proper structure of the walls of the frond, and the position of the fructification; and the following emended generic character is offered:—

GEN. CHAR. *Fron*d tubular; the tube at first occupied by a lax network of longitudinal, anastomosing filaments; at length distended and empty. Walls composed of longitudinal, anastomosing filaments, emitting toward the circumference dichotomous, moniliform branches, which form a middle stratum; cortical stratum composed of a single layer of small cells. *Favellæ* roundish, formed by a metamorphosis of the dichotomous branches. *Tetraspores* dispersed, cruciate, with wide limbs, sunk beneath the cortical stratum, formed of one of the cells of the dichotomous branchlet.

From this it will be seen that *Dumontia* has nearly the same structure as *Catenella*, omitting the constricted branches. The statement made under Pl. LIX. that I had seen no tetraspores of this common plant, has brought me specimens from several kind correspondents, to whom my thanks are due. At the same time (to my shame be it spoken) I find, on examining some old specimens collected in 1832, that I ought to have made no such statement, and further, that the *tetraspores* of this Alga are very common. It sometimes happens that botanists are less acquainted with the structure of very common than of rarer plants, and in this instance I have to plead guilty to a careless want of observation.

-
- B. Fig. 1. Vertical slice of the wall of DUMONTIA FILIFORMIS, with *tetraspores*.
2. Small portion of the same. 3. Vertical slice of a specimen with *favellæ*.
4. Small portion of the same:—all the figures *more or less highly magnified*.
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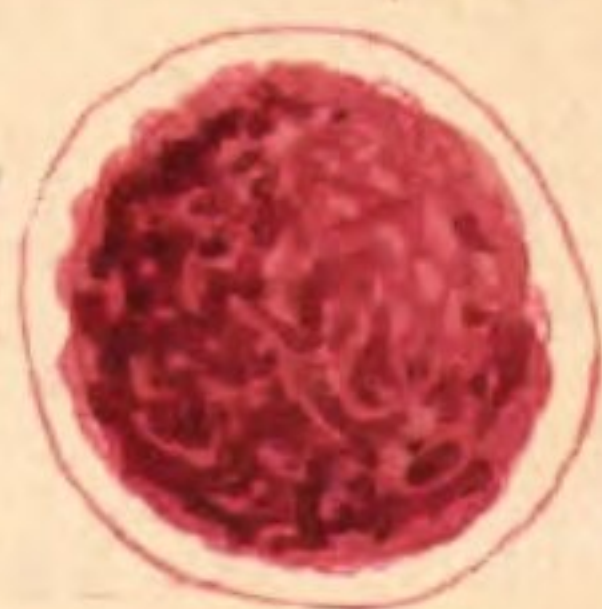
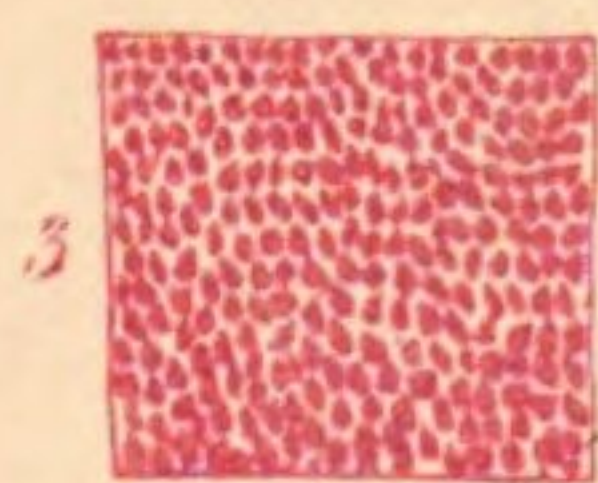
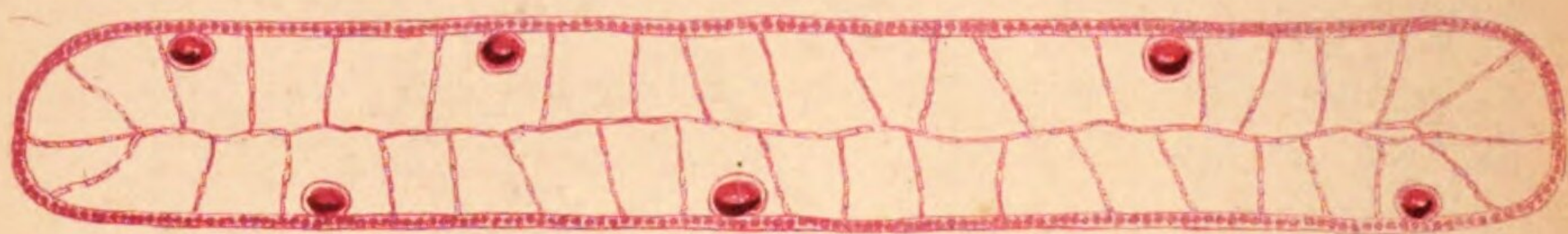


PLATE CXII.

HALYMENIA LIGULATA, *Ag.*

GEN. CHAR. *Frond* compressed or flat, pinky red, gelatinoso-membranaceous, consisting of a delicate membrane, whose walls are separated by a very lax net-work of jointed fibres; cells of the membrane minute, coloured. *Fructification*, spherical masses of spores (*favellidia*) immersed in the frond, attached to the inner surface of the membranous periphery.

HALYMENIA (*Ag.*),—from *ἅλς*, the *sea*, and *ὑμην*, a *membrane*.

HALYMENIA *ligulata*; frond compressed or flat, irregularly dichotomous or palmate, the segments attenuated, often proliferous at the margin.

HALYMENIA *ligulata*, *Ag. Sp. Alg.* vol. i. p. 210. *Ag. Syst.* p. 244. *Spreng. Syst. Veg.* vol. iv. p. 333. *Grev. Alg. Brit.* p. 162. t. 17. *Hook. Br. Fl.* vol. ii. p. 308. *Harv. in Mack. Fl. Hib.* part 3. p. 188. *Harv. Man.* p. 52. *Wyatt. Alg. Danm.* no. 425. *Endl. 3rd Suppl.* p. 40.

HALYMENIA *elongata*, *Ag. Sp. Alg.* vol. i. p. 209. *Ag. Syst.* p. 243. *J. Ag. Medit.* p. 98.

HALARACHNION *ligulatum*, *Kütz. Phyc. Gen.* p. 394. t. 74. f. 1.

ULVA *ligulata*, *Woodw. in Linn. Trans.* vol. iii. p. 54. *E. Bot.* t. 420.

ULVA *rubra*, *Huds. Fl. Ang.* p. 571. *E. Bot.* t. 1627.

MESOGLOIA *Hudsoni*, *Ag. Syst.* p. 50 (*not of British authors*).

HAB. On rocks and stones near low-water mark, rare; more usually dredged in 6–10 fathoms water. Annual. Summer. Frequent on the southern shores of England, in many places. Coast of Norfolk, *Mr. L. Wigg*, *Mr. Turner*, &c. Anglesea, *Rev. H. Davies*. East, south and western shores of Ireland. Very common in Jersey, *Miss White* and *Miss Turner*. Rare in Scotland; Orkney, *Rev. J. H. Pollexfen*.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea.

DESCR. *Root* small, scutate. *Frond* extremely variable in ramification, and even in substance, but resolvable into three principal varieties. *α. dichotoma*; frond six to eight inches long, from half a line to one or two lines broad, compressed, very gelatinous, many times divided in an irregularly dichotomous manner, the divisions nearly of equal breadth, becoming gradually narrower toward the extremities, which are acuminate. *β. ramentacea*; frond twelve to fourteen inches long, or more, half an inch in breadth, compressed, gelatinous, divided into three or four principal branches, from the sides of which issue very numerous, simple or occasionally forked *ramenta* constricted at base, tapering to an acute point, cylindrical or nearly so. Occasionally the *ramenta* are very thin, almost setaceous, and proportionably numerous and subdivided. *γ. latifolia*; frond twelve to twenty inches long, two to four inches wide, perfectly flat, stipitate, wedge-shaped, simple or forked, or irregularly palmate, of a darker colour, and less gelatinous substance than the two former varieties. *Colour* varying from a pale to a strong rose-red, or in the broad variety a deep red. *Substance* gelatinous and tender, very

soft, elastic, and adhering to paper, shrinking very much in drying. *Fructification*, abundantly scattered through the whole substance of the frond, resembling minute dots.

Though probably first noticed by Hudson, whose *Ulva rubra* we have quoted as a synonyme, this plant was first clearly described, and its characters defined by Woodward, in the 'Linn. Trans.' for the year 1797. Among British Algæ few exhibit wilder variations in form, and yet I have never known it to be mistaken by any person who has once had the advantage of seeing it in a living state. The pinky colour, and peculiarly soft substance, between gelatinous and membranaceous, and the innumerable dots of fructification are found in every specimen, and sufficiently mark the species. In form and size, there is extraordinary variety. The specimens we have selected for illustration, unlike as they are, are only very moderately different, compared to some others which exist in our herbarium. And yet an extensive suite of forms exhibits so perfect a gradation from the narrowest and most compound, to the broadest and most simple, that it is impossible to fix exactly the limits where one variety ends, and another begins. That all, therefore, belong to one species, is generally allowed.

Possibly the *H. elongata* of Agardh, of which I have seen no authentic specimen, may be, as Prof. J. Agardh states, a distinct plant. But the specimens which I possess under this name, are certainly only a narrow form of *H. ligulata*, such as is frequently found on the south coast of England. Our variety γ , *latifolia*, in its typical form, has much more the characters of a species, distinguished by a thinner and more compact substance, and a darker colour.

Fig. 1. HALYMENIA LIGULATA, var. β . and γ ., small specimens:—*of the natural size.* 2. A transverse section of the frond. 3. Portion of the membranous wall. 4. A favellidium. 5. Spores.

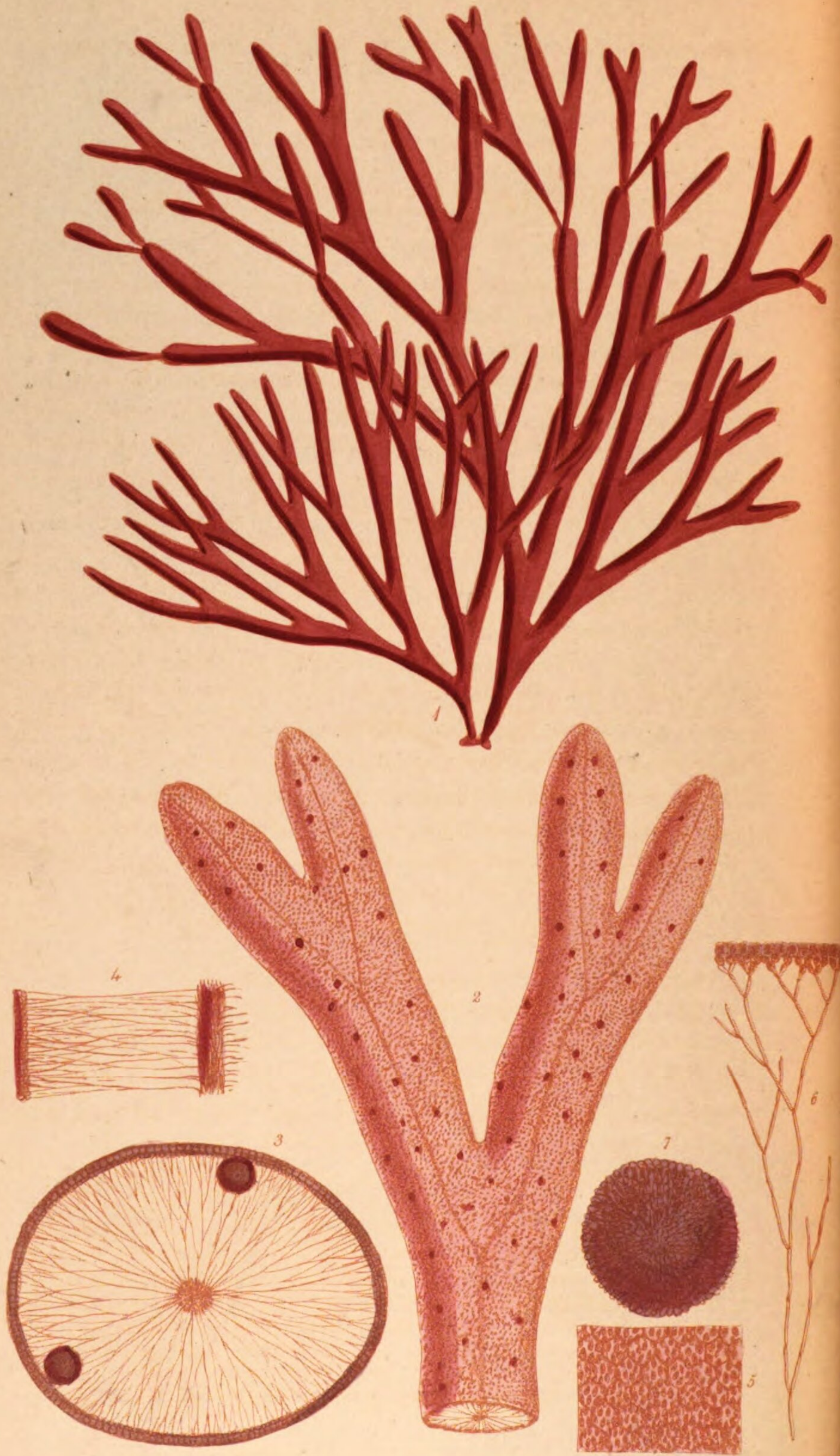


PLATE LXIX.

GINNANIA FURCELLATA, *Mont.*

GEN. CHAR. *Frond* terete, dichotomous, membranaceo-gelatinous, traversed by a fibrous axis from which slender dichotomous horizontal filaments radiate towards the membranous periphery; surface cellules hexagonal. *Fructification*, spherical masses immersed in the frond, affixed to the inner coating of the periphery, composed of radiating filaments, whose apical joints are finally converted into spores. GINNANIA (*Mont.*), in honour of *Count G. Ginnani*, of Ravenna, author of a work on the productions of the Adriatic sea, published 1755.

GINNANIA *furcellata*; frond cylindrical, tender, uniformly dichotomous; the segments obtuse.

GINNANIA *furcellata*, *Mont. Pl. Cell. Can.* p. 162. *Endl. 3rd Suppl.* p. 40.

HALYMENIA *furcellata*, *Ag. Sp. Alg.* vol. i. p. 212. *Ag. Syst.* p. 244. *Grev. Alg. Brit.* p. 163. *Hook. Br. Fl.* vol. ii. p. 308. *Harv. in Mack. Fl. Hib.* part 3. p. 189. *Wyatt, Alg. Danm.* no. 79. *J. Ag. Alg. Medit.* p. 98. *Hook. fil. et Harv. in Lond. Journ. Bot.* vol. iv. p. 548.

MYELOMIUM *furcellatum*, *Kütz. Phyc. Gen.* p. 393. t. 73. f. 1.

ULVA *furcellata*, *Turn. in Scr. Journ.* 1800-2. p. 301. *E. Bot.* t. 1881.

ULVA *interrupta*, *Poir. Encycl.* vol. viii. p. 171. *D.C. Fl. Fran.* vol. vi. p. 3.

DUMONTIA *triquetra*, *Lamour. Ess.* p. 45.

CORALLOPSIS *dichotoma*, *Suhr. Bot. Zet* (1839). p. 70. f. 44.

Var. β , *subcostata*, broader than usual, with a stronger nerve, and here and there constricted.

HALYMENIA *furcellata*, β . *subcostata*, *J. Ag. Alg. Medit.* p. 98.

HAB. On rocks, stones, oyster shells, &c., from low water mark to eight or ten fathoms water. Annual. Summer. Rather rare. Eastern and southern shores of England, frequent. Bantry Bay, *Miss Hutchins.* Malbay, *W. H. H.* Glenarm, *Miss Davison.* Howth, *Miss Gower.* Roundstone Bay, *Mr. Mc' Calla.* Strangford Lough, *Mr. Thompson.* Belfast Bay, *Mr. G. Hyndman.* Not found in Scotland?

GEOGR. DISTR. Atlantic shores of Europe. Baltic and Mediterranean Seas. Cape of Good Hope. New Zealand. Chili. Sandwich Islands.

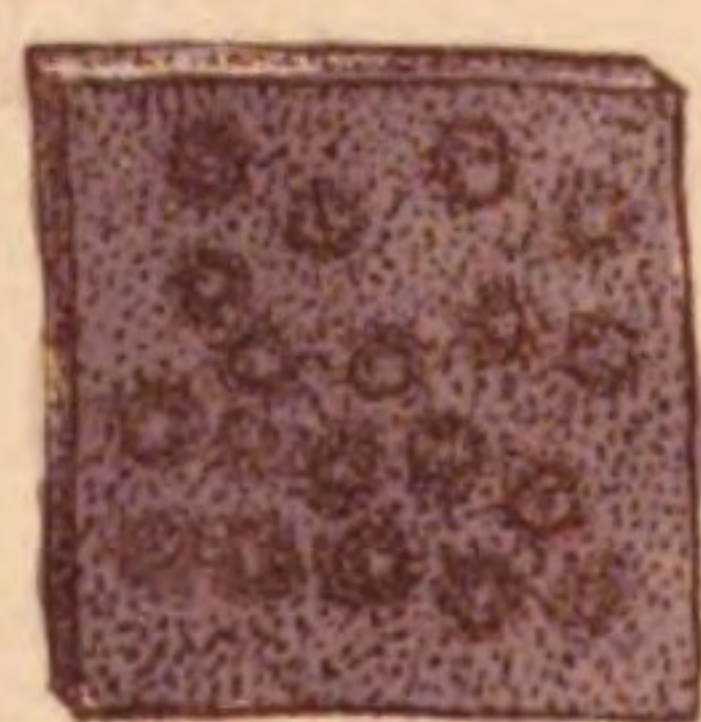
DESCR. *Root*, a small scutate disc. *Fronds* subsolitary, or several growing together, from two to eight or ten inches in length, and from a line to nearly half an inch in diameter, cylindrical or subcompressed, tapering to the base, repeatedly and regularly dichotomous, the furcations of equal length, and the tufts perfectly fastigate. *Apices* generally obtuse and rounded, occasionally lengthened out to a bluntish or subacute point. Sometimes the frond is constricted in several places as if jointed, and occasionally when the branches become accidentally truncated, young frondlets

are produced proliferously from the wounded part. The whole frond is traversed through its centre by an axis composed of innumerable, slender, intertwined filaments, which is sometimes very visible through the outer skin, at other times obscure, but may always be found by carefully making a transverse section of any part. From this axis there issue horizontally radiating dichotomous jointed filaments, which connect it with the wall or periphery of the frond. The interval between the filaments is filled with a watery gelatine. The *fructification* is abundantly scattered throughout the whole frond, and may invariably, I believe, be found on all specimens. It consists in spherical masses attached beneath the membranous periphery, and made up of densely packed filaments radiating from a central point. At maturity the outer portions of these develop spores. The colour varies from a brownish red to a clear transparent pink, and the substance from firmly membranaceous, to very tender and gelatinous. It shrinks very much in drying, and never perfectly recovers its form on re-immersion.

The earliest description of this species was by Mr. Dawson Turner, in the year 1800, whose specimens were collected at Sheringham in Norfolk. Since that time it has been found on many parts of the shores of Europe, and also brought from very distant places in both hemispheres, and in the Pacific, as well as Atlantic Oceans. Those which I possess from the Southern Ocean, are in all respects identical with British specimens.

But though this plant is so widely distributed, and ought to be so well known, a very remarkable feature of its structure has been passed over by most authors who have described it, and only recently mentioned by Professor J. Agardh, as characteristic of his var. β . I allude to the *axis* or internal *costa*, which exists in all specimens which have come under my notice, though it is very much more apparent in some than in others. Owing to the imperfect manner in which the frond recovers its form on immersion, after having been dried, this *costa* cannot always be shown by a transverse cutting of a dried specimen; but in the recent plant it may at once be detected, even where most obscure. In the var. β . it is remarkably strong, and appears in a flattened dried specimen like the mid-rib of a *Delesseria*. This I have already noticed in the 'Manual', as existing in specimens found by Miss Hutchins at Bantry.

Fig. 1. GINNANIA FURCELLATA:—*the natural size*. 2. Apex of a branch:—*slightly magnified*. 3. Transverse section. 4. Longitudinal semi-section of a branch. 5. Vertical view of the membrane of the frond. 6. Portion of one of the radiating filaments and of the cellules of the periphery. 7. Globule of fructification:—*all more or less highly magnified*.



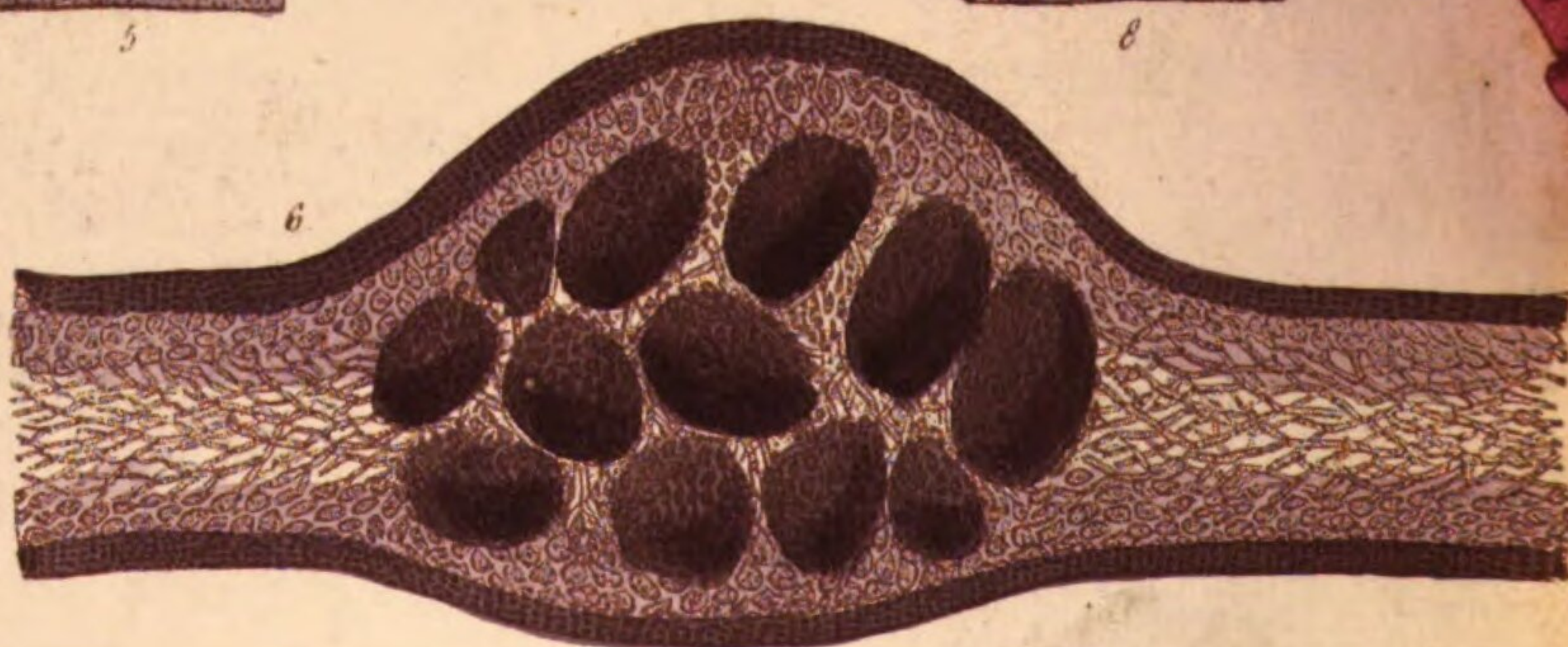
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8



6



PLATE XIII.

KALYMENIA RENIFORMIS, *J. Ag.*

GEN. CHAR. *Frond* blood-red, ribless, expanded, carnosio-membranaceous, formed internally of three strata; the *inner*, of interlacing filaments; the *medial*, of large, roundish cells; the *outer*, of minute, vertically disposed cellules. *Fructification* two-fold, on distinct plants: 1, spherical masses of spores (*favellidia*) semi-immersed in the frond; 2, triangularly divided, scattered *tetraspores*. KALYMENIA—from *καλος*, *beautiful*, and *ὑμῆν*, a *membrane*.

KALYMENIA *reniformis*; stem short, cylindrical, suddenly expanding into a roundish, subsimple or irregularly cleft, somewhat lobed frond; favellidia densely scattered over the surface.

KALYMENIA *reniformis*, *I. Ag. Alg. Medit.* p. 99. *Endl. 3rd Supp.* p. 40. (*Excl. Syn. Post. and Rupp.*)

IRIDÆA *reniformis*, *Bory, Dict. Class.* vol. ix. p. 16. *Grev. Alg. Brit.* p. 160.

HALYMENIA *reniformis*, *Ag. Sp.* vol. i. p. 201. *Syst.* p. 241. *Spr. Syst. Veg.* vol. iv. p. 333. *Gaill. Dict. Sc. Nat.* 53. p. 361.

RHODOMENIA *reniformis*, *Hook. Br. Fl.* vol. ii. p. 292. *Wyatt, Alg. Damn.* no. 19. *Harv. in Mack. Fl. Hib.* part 3. p. 195. *Manual*, p. 64.

EUHYMENIA *reniformis*, *Kütz. Phyc. Gen.* p. 400.

SARCOPHYLLIS *lobata*? *Kütz. l. c.* p. 401. t. 76. f. 3.

FUCUS *reniformis*, *Turn. Hist. Fuc.* t. 113. *E. Bot.* t. 2116.

HAB. In deep shady pools, at extreme low water mark, rare. Often washed on shore from deeper water. Perennial? Summer and Autumn. Niton, *Miss Everett*. Devonshire, *Mrs. Griffiths* and *Miss Hill*. Cornwall, *Mr. Rashleigh*; *Mr. Ralfs*. Bantry Bay, *Miss Hutchins*. Malbay, *W. H. H.* Antrim, *Mr. Moore*. Coast of Down, *Miss Davison*; *Mr. W. Thompson*. Orkney, *Rev. Mr. Pollexfen*. Kerry, *Mr. Andrews*. Scilly Islands and Jersey, *Miss White*.

GEOGR. DISTR. Shores of the British Islands. Atlantic shores of France (and Spain?) Mediterranean Sea? (*Ag.*)

DESCR. *Root* scutate. *Stem* $\frac{1}{4}$ to $\frac{1}{2}$ inch long, cylindrical or compressed, suddenly expanding into a roundish, elliptical or reniform frond of a soft, thickish-membranaceous substance, and blood-red colour, simple, or producing at the margin secondary fronds resembling the primary one in form and substance. These vary in breadth from an inch to 6–8 or even 14 inches, but rarely sport much in form, except when continuing to grow after they have been torn by the waves. *Favellidia* the size of poppy seed, densely scattered over the frond to which they give a peculiarly gritty feel, semi-immersed, containing several clusters of dark-red, oblong, somewhat angular seeds, densely packed together. *Tetraspores* extremely minute, scattered among the surface cellules. The structure, as shown at fig. 6, consists of three strata; the *inner*, composed of branched and anastomosing

jointed filaments, formed of long, cylindrical cells; the *medial*, of long, irregularly disposed, elliptical cells; the *outer*, of minute, vertically placed, dark-red cellules, forming simple filaments whose tips constitute the minute surface cells seen when the frond is viewed under the microscope.

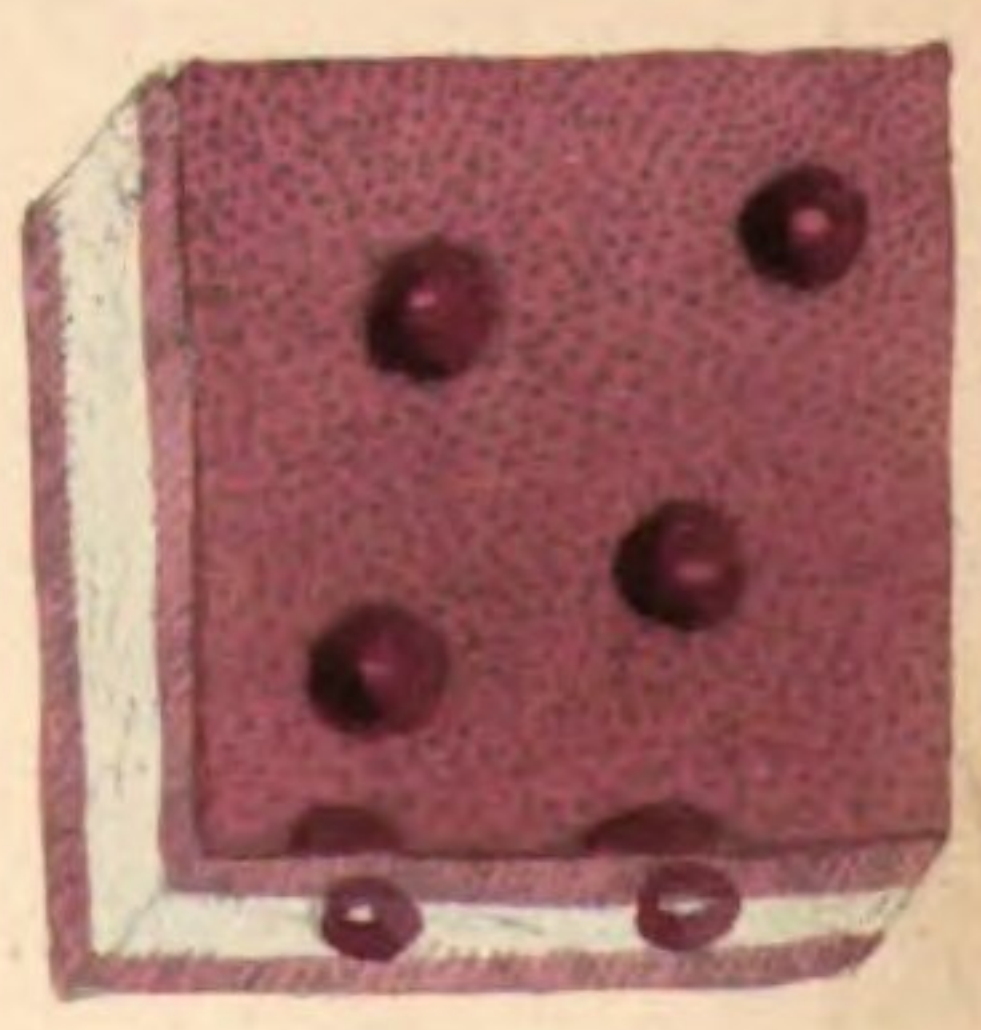
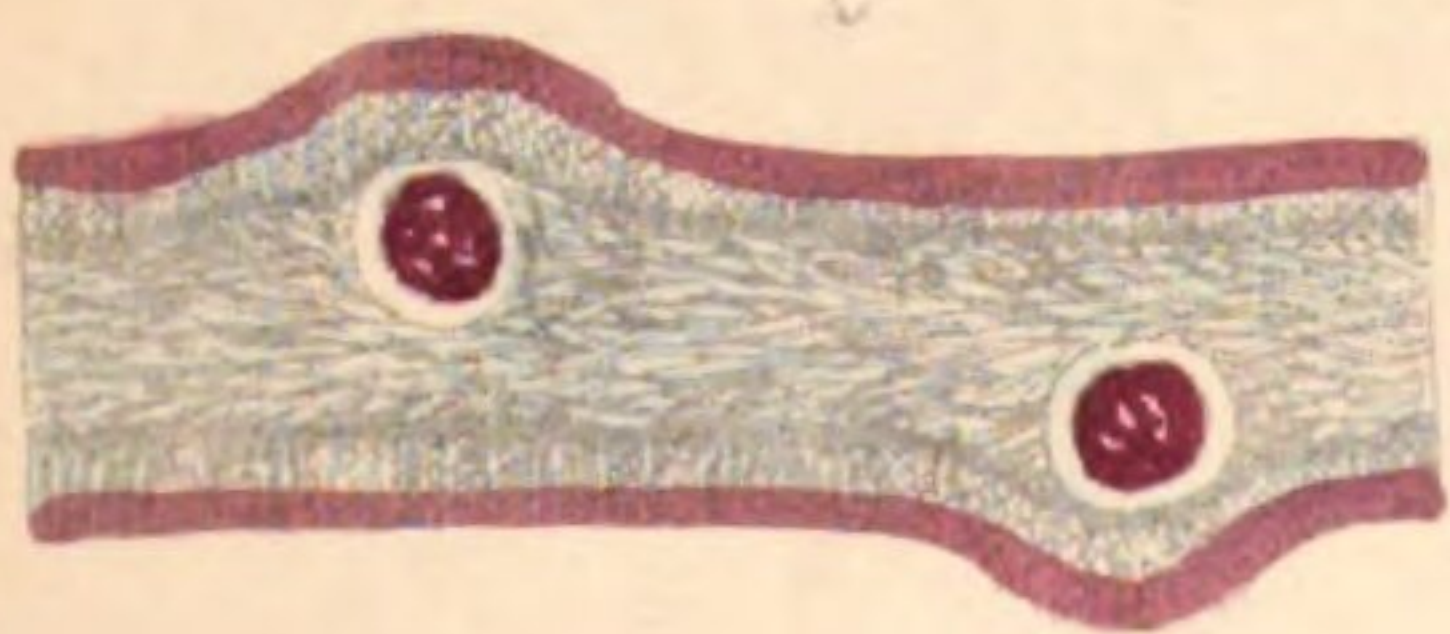
Kalymenia reniformis, first described in the '*Historia Fucorum*,' was discovered by Miss Everett, early in the present century, on the shores of the Isle of Wight, and long regarded as an extremely rare species. Of late years many new habitats have been ascertained for it, and it is now, at least in Ireland, known to be far from uncommon. In Scotland it appears to be more rare, and yet it occurs as far north as Orkney. At Falmouth, Miss Warren finds specimens without fruit, which differ from the usual state of the species in being of a more oblong form, and much more tapering at the base. These may possibly belong to a new, but nearly allied species, and I therefore abstain from noting them further at present.

I have ventured to quote *Sarcophyllis lobata*, Kütz., founded by that author on a specimen gathered at Sidmouth, and existing in the herbarium of Senator Binder of Hamburgh, under the present species, but how far I am correct in so doing cannot be determined without consulting the original specimen.

Fucus acetabulum, Gouan, quoted by Agardh as a synonyme of his *Halymenia reniformis*, and which, so far as I know, is the only authority for his Mediterranean habitat, is, as I have ascertained by an original specimen in Herb. Hooker, a totally different plant; namely, *Constantinea reniformis*, Post. and Rupp. (*Crytonemia?* *Forbesii*, Harv. in Hook. Ic. t. 679; *Neurocaulon foliosum*, Zanard.). Endlicher, misled by Agardh, confounds these species, and consequently, but most incorrectly, reduces the well-distinguished genus CONSTANTINEA (founded on *Fucus rosa-marina*, Gm.) under *Kalymenia*.

The Cape of Good Hope specimens, mentioned in the Manual, are regarded by Professor J. Agardh as belonging to a distinct species, named by him *K. Harveyana*.

Fig. 1 and 4. *KALYMENIA RENIFORMIS*, with tetrasporic fruit. 2 and 3, with favellidia:—*natural size*. 5, Portion of the frond, with a cluster of favellidia. 6. Section showing the structure of the frond, and of a favellidium. 7. Spores. 8. Portion of the frond with tetraspores. 9. Tetraspores:—all more or less *magnified*.



W.H. del et lith.

Reeve trap

PLATE CXXIII.

KALLYMENIA DUBYI, *Harv.*

GEN. CHAR. *Frond* blood-red, ribless, expanded, carnosomembranaceous, formed internally of three strata; the *inner*, of interlacing filaments; the *medial*, of large, roundish cells; the *outer*, of minute, vertical filaments. *Fructification* two-fold, on distinct plants; 1, spherical masses of spores (*favellidia*), semi-immersed in the frond; 2, triangularly divided, scattered tetraspores. KALLYMENIA (*J. Ag.*),—from *καλλίς*, *beautiful*, and *ὑμην*, a *membrane*.

KALLYMENIA *Dubyi*; stem compressed, gradually expanding into an obovate, simple, dull-red frond, wedge-shaped at base; favellidia very minute, densely scattered over the surface.

HALYMENIA *Dubyi*, *Chauv. Bot. Gall.* p. 944.

HALYMENIA *laminarioides*, *Bory, sec. Lenorm.*

NEMOSTOMA *Dubyi*, *J. Ag. Alg. Medit. in not.* p. 96.

IRIDÆA *Dubyi*, *Lenorm. in Herb.*

DELESSERIA *Ferrarii*, *Bonnem. et Lamour. sec. Lenorm.*

HAB. On rocks and stones, within tide-marks, in land-locked bays. Annual. Spring and early summer. Falmouth Harbour, *Miss Warren*. Plymouth, *Rev. W. S. Hore*, and *Mr. J. W. Rohloff*. (Carnlough Bay, *Miss Davison*. [1833.] Belfast Bay, in ten fathoms water, *Mr. W. Thompson*.)

GEOGR. DISTR. Atlantic shores of France and Spain.

DESCR. *Root* a small, conical disc. *Stem* a line or two in length, compressed, soon expanding into the cuneate base of the frond. *Fronds* six to twelve inches long, three to five inches wide, carnosomembranaceous, oblong, or more or less obovate, somewhat undulate at the margin, simple, obtuse, tapering at the base; rarely cloven, and never naturally so; in age becoming thicker and more cartilaginous. *Fructification*; very minute, dot-like favellidia, immersed in the substance of the leaf, somewhat prominent on one surface, densely scattered over the whole frond, spherical, containing a dense mass of angular spores, surrounded by a hyaline pericarp. *Colour* a dull, deep red, becoming paler, and, finally yellowish in age.

In the remarks under *Kal. reniformis*, already figured at Plate XIII., I have noticed a plant as having been found at Falmouth by *Miss Warren*, which I suggested might belong to a different, but closely allied, species. The figure now given is

taken from one of Miss Warren's specimens, and it appears to be identical with what I have received from M. Lenormand as the *Halymenia Dubyi* of Chauvin. It will be seen that the frond is considerably different in form from the typical specimens of *K. reniformis*, the outline much more approaching that of *Iridaea edulis*. Some of Miss Warren's specimens are even larger than here represented; but the majority are of less size. All have very much the same general outline: those gathered at a later period of the year are of a much firmer consistence and denser substance than the rest. From the Rev. Mr. Hore I possess specimens gathered at Plymouth, quite similar to the Falmouth ones, except that they are split at the apex; a peculiarity which originated, Mr. Hore informs me, after they had been gathered. I am not quite so certain that the Irish habitats given, on Mr. Thompson's authority, belong to this species, and not to a variety of *K. reniformis*, the specimens which I have seen not being in a sufficiently perfect state to remove all ambiguity. Should these stations be established, the merit of having added a new plant to our flora must attach to Miss Davison; whose specimens are dated so long back as 1833.

Besides mere form, which is not absolutely to be depended on, this plant differs from *K. reniformis* in the duller colour, in its globules of spores being of a much smaller size, and somewhat in the structure of the frond. It arrives at maturity, too, at a much earlier season, being in greatest perfection in March and April, and becoming much faded and passing into decay in August; just at the period when the full-grown and strongly coloured fronds of *Kal. reniformis* begin to come on shore. Whether or not that species be perennial, as seems probable, from the proliferous individuals which are frequently found, the present is certainly an annual, arriving at maturity and passing away within six months.

Fig. 1. KALLYMENIA DUBYI:—of the natural size. 2. Transverse section of the frond, and of the favellidia. 3. Fragment, to show the surface cellules. 4. A favellidium:—magnified.



PLATE XCVII.

IRIDÆA EDULIS, *Bory*.

GEN. CHAR. *Frond* flat, carnosio-cartilaginous, dull red; the central substance composed of densely interwoven, longitudinal fibres; the *periphery* of closely packed, horizontal, moniliform filaments. *Fructification* of two kinds, on distinct individuals; 1, spherical masses of spores (*favellidia*) immersed in the frond; 2, *tetraspores* forming a stratum at the base of the filaments of the periphery. IRIDÆA (*Bory*), —from *iris*, the *rainbow*; because some species reflect rainbow colours when growing under water.

IRIDÆA *edulis*; frond undivided, obovate, rounded at the apex, wedge-shaped at the base; with a short stem.

IRIDÆA *edulis*, *Bory*, in *Dict. Class. d'Hist. Nat.* vol. ix. p. 15. *Grev. Alg. Brit.* p. 158. t. 17. *Hook. Brit. Fl.* vol. ii. p. 308. *Wyatt, Alg. Danm.* no. 78. *Harv. in Mack. Fl. Hib.* part. 3. p. 189. *Harv. Man.* p. 53. *Endl. 3rd Suppl.* p. 37. *Kütz. Phyc. Gen.* p. 396.

HALYMENIA *edulis*, *Ag. Sp. Alg.* vol. i. p. 202. *Ag. Syst.* p. 242. *Hook. Fl. Scot.* part 2. p. 107. *Spreng. Syst. Veg.* vol. iv. p. 333.

DELESSERIA *edulis*, *Lamour. Ess.* p. 38.

ULVA *edulis*, *Decand. Fl. Fr.* vol. ii. p. 12. *Grev. Fl. Edin.* p. 298.

FUCUS *edulis*, *Stack. Ner. Brit.* p. 57. t. 12. *With.* vol. iv. p. 101. *Turn. Syn.* vol. i. p. 180. *Turn. Hist.* t. 114. *E. Bot.* t. 1307. *Hook. in Fl. Lond.* cum icone.

FUCUS *dulcis*, *Gm. Hist. Fuc.* p. 189. t. 26 (the figure only; the description belongs to *F. palmata*).

FUCUS *lactuca*, *Esper, Ic. Fuc.* vol. i. p. 129. t. 64.

FUCUS *carnosus*, *Schmidel, It.* p. 76. *Esp. l. c.* p. 150. t. 76.

FUCUS *palmatus*, *β. Lightf. Fl. Scot.* p. 935.

HAB. On marine rocks, near low-water mark. Perennial. Fruiting in winter. Frequent on the shores of the British Islands, from Orkney to Jersey.

GEOGR. DISTR. Atlantic shores of Europe, from the shores of Iceland (*Esper*) to Spain (*Ag.*). Baltic Sea, *Agardh, Aresch!* Mediterranean at Malaga, *Ag.* Cape of Good Hope, according to a specimen in Herb. Paris, *Ag.*

DESCR. *Root*, an expanded callus. *Fronds* numerous from the same base, from six inches to a foot or more in length, and from two to six inches in breadth at the widest part, rising with a short, cylindrical stem, of a few lines in length, which becomes first compressed, then quite flat, and gradually expands into the cuneate base of a perfectly simple, obovate frond, which is very obtuse and rounded at the apex. It is subject to very little natural variation in form, except in being occasionally oblique, one side expanding more rapidly than the other; but no plant is more subject to injury either from the attacks of marine animals, or laceration by the

waves, and its fronds are usually much perforated, or split longitudinally; the apices erose or laciniated. *Fructification*; 1, *favellidia* immersed beneath the periphery, densely scattered in the upper portion of the frond, appearing to the eye like minute dark red dots, composed of very densely packed, angular spores; 2, *tetraspores* either triparted or cruciate, disposed in very dense band-like sori, the sorus lying beneath the filaments of the periphery, and extending across the upper portion of the frond. *Colour* a full dark blood-red; becoming much darker in drying. *Substance* firmly cartilaginous, or somewhat fleshy.

It is a singular, and almost an unaccountable fact, that this plant, than which none are more invariable in character, or more distinct in general appearance, should have been long confounded with *Rhodymenia palmata*, a plant of a very different form, different structure, and different substance. Withering was the first author who clearly defined the present; but it is to be regretted that he assigned the specific name *edulis* to it, for though a favourite, certainly, with marine worms, it rarely constitutes a part of human food; the *R. palmata* being the true eatable *Fucus* or *Dulse* of the Scotch and Irish. I have never seen *I. edulis* eaten, but Stackhouse tells us that in Cornwall it is sometimes eaten by fishermen, who crisp it over the fire. The same author speaks of a fine ruby-coloured dye being extracted from it by simple maceration. Similar dyes exist in a great number of Algæ, but I should fear that they would not prove of a very permanent character.

The genus *Iridæa* is widely dispersed over the world, the maximum of the species being in the Pacific and Southern Oceans. Many of them are of very large size, and almost all, are excessively variable in form. Several of Bory's species have now been properly moved by Prof. J. Agardh, to the genus *Gigartina*, namely, *I. radula*, *striata*, *papillora*, and their allies.

Fig. 1. *IRIDÆA EDULIS*:—of the natural size. 2. Section of a frond producing favellidia. 3. Section of a frond producing tetraspores. 4. Tetraspores separated:—all magnified.

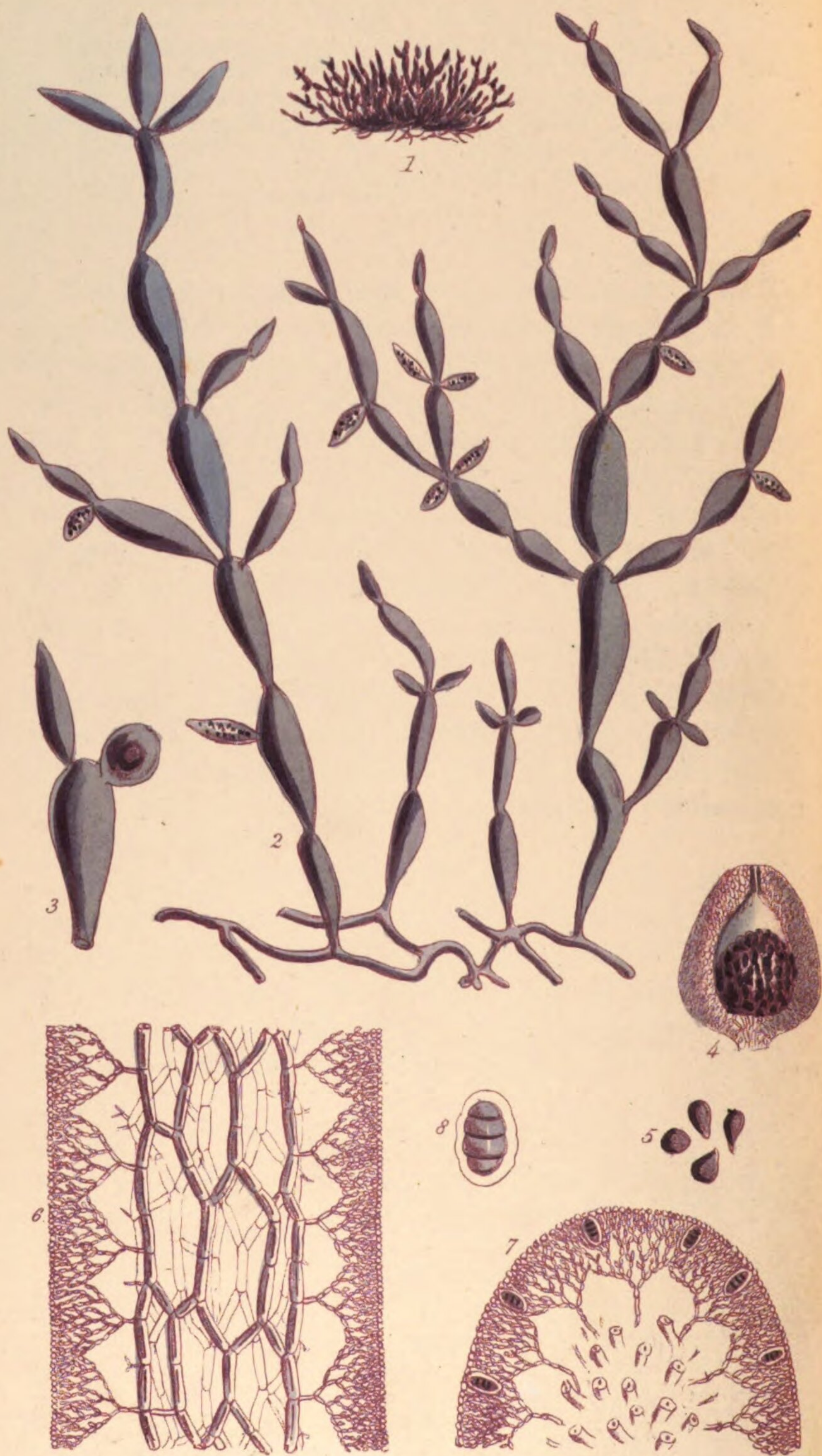


PLATE LXXXVIII.

CATENELLA OPUNTIA, *Grev.*

GEN. CHAR. *Frond* dull-purple, membranaceous, filiform, constricted at intervals; its axis composed of a lax net-work of anastomosing, longitudinal filaments; its periphery of densely compacted, dichotomous, moniliform filaments. *Fructification* of two kinds, on distinct individuals; 1, spherical masses of *spores* (*favellidia*), contained in external capsular bodies (abortive ramuli, resembling *ceramidia*); 2, solitary oblong, transversely parted *tetraspores*, surrounded with a limbus, and formed from the filaments of the periphery, in which they are immersed. CATENELLA (*Grev.*),—*a little chain*, “in allusion to the chain, or necklace-like form of the frond.”

CATENELLA *opuntia*; fronds rising from a mass of creeping fibres, vaguely branched; pseudo-articulations lanceolate or elliptical, about four times as long as broad.

CATENELLA *opuntia*, *Grev. Alg. Brit.* p. 166. t. 17. *Hook. Br. Fl.* vol. ii. p. 309. *Harv. in Mack. Fl. Hib.* part 3. p. 188. *Harv. Man.* p. 51. *Wyatt, Alg. Danm.* no. 126. *J. Ag. Alg. Medit.* p. 89. *Endl. 3rd Suppl.* p. 37. *Kütz. Phyc. Gen.* p. 394. t. 76. f. 4.

CHORDARIA *opuntia*, *Spreng. Syst. Veg.* vol. iv. p. 330.

LOMENTARIA *opuntia*, *Gaill. Dict. Hist. Nat.* v. 53. p. 367.

HALYMENIA? *opuntia*, *Ag. Sp. Alg.* vol. i. p. 217. *Syst.* p. 245.

CHONDRIA *opuntia*, *Hook. Fl. Scot.* part 2. p. 106. *Grev. Fl. Edin.* p. 292.

GIGARTINA *opuntia*, *Lamour. Ess.* p. 49.

GIGARTINA *pilosa*, *Lamour. l. c.* p. 49 (see *Ag.*).

RIVULARIA *opuntia*, *Gm. Eng. Bot.* t. 1868.

FUCUS *opuntia*, *Good. and Woodw. in Linn. Trans.* vol. iii. p. 219. *Stack. Ner. Brit.* p. 104. t. 16. *Turn. Syn. Fuc.* vol. ii. p. 387. *Turn. Hist.* t. 107.

FUCUS *repens*, *Lightf. Fl. Scot.* vol. ii. p. 961. *With.* vol. iv. p. 91.

FUCUS *cæspitosus*, *Stack. Ner. Brit.* p. 59. t. 12.

ULVA *articulata* β . *Huds. Fl. Angl.* p. 569.

HAB. On submarine rocks, piles, &c., near high-water mark. Perennial. Not uncommon on the shores of England, Ireland, Scotland, and the Orkney Islands. Rarely found in fruit.

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean Sea. New Zealand, *Dr. Hooker*.

DESCR. *Root*, a mass of creeping, irregularly branched fibres. *Fronde*s springing from the creeping fibres, erect, densely tufted, and forming patches two or more inches in diameter, spreading over any substance which they encounter, half an inch to nearly an inch in height, sparingly branched, constricted at intervals into a string of oblong or lanceolate pseudo-articulations. *Branches* similar to the main stem, alternate or opposite, simple or forked, their terminal joints acute. *Substance* membranaceous. *Structure*; the

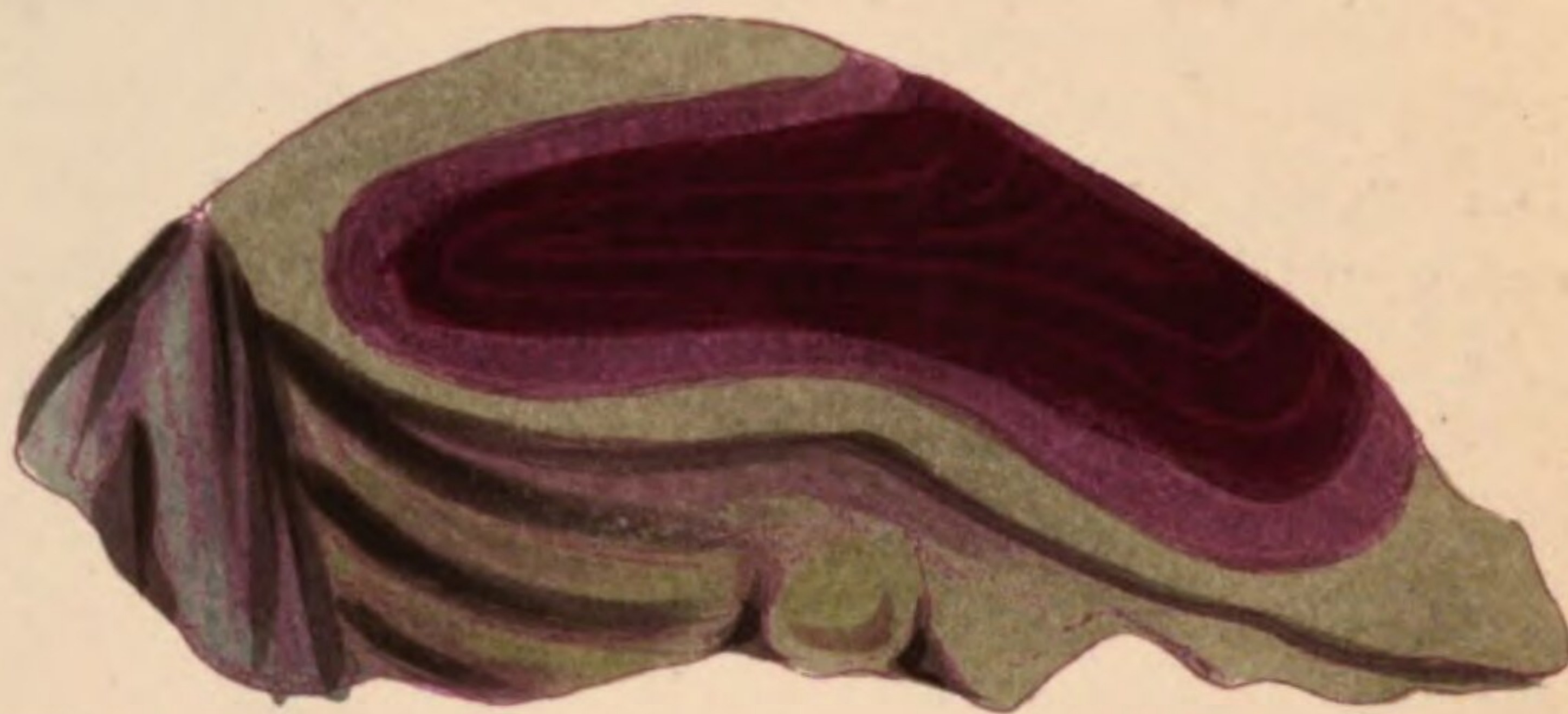
central portion of the frond is filled with a watery mucus, through which run longitudinal jointed fibres, with a narrow, coloured endochrome and a wide pellucid limbus, anastomosing together into a lax net-work, with large, oblong, subhexagonal meshes; these constitute the axis: the periphery or outer wall of the frond is formed of very delicate, closely packed, horizontal dichotomous, moniliform filaments, which spring from the most exterior of the fibres of the net-work, and their apices, closely glued together, unite into the membranous coat of the frond. *Fructification*; 1, spherical masses of spores or *favellidia* contained in ovate capsules, furnished with a terminal pore, their walls formed of moniliform filaments. The mass of spores appears to be formed by a transformation of the internal net-work. 2. Oblong *tetraspores* divided at maturity by three transverse lines, formed from the filaments of the periphery, and scattered at intervals among them. *Colour* a dull purple.

This curious little plant appears to have been first noticed by Dillenius, in whose Herbarium specimens are preserved, according to Mr. Turner; and was next excellently described by Lightfoot, who remarks that its branches resemble "the jointed leaves of the *Cactus opuntia*," a resemblance which has suggested the specific name, by which it has since been universally distinguished. Lightfoot's trivial name "*repens*" has, however, the priority: though no one has adopted it.

Its generic relations were, as appears by the numerous synonyms, long imperfectly understood, and few Algæ have been more tossed about from one group to another, until, in 1830, Dr. Greville proposed it as the type of a new genus, in which step he has since been gladly followed by every succeeding author. His judgment was formed solely from consideration of the structure of the frond; the fructification being unknown to him. The *tetraspores* were first described, so far as I am aware, by Prof. J. Agardh, in his '*Algæ Mediterraneæ*,' his specimens having been received from Professor Meneghini, and they have been excellently figured by Kützinger, in his great work. In this country both kinds of fruit were discovered by Mrs. Griffiths, to whose kindness I am indebted for all the specimens I have seen.

C. opuntia can only be confounded with a dwarf state of *Chylocladia articulata*, which is about the same size. But, not to speak of difference of structure, the brighter colour, cylindrical joints, delicate substance, acute angles, and forked fronds of the latter, sufficiently distinguish it.

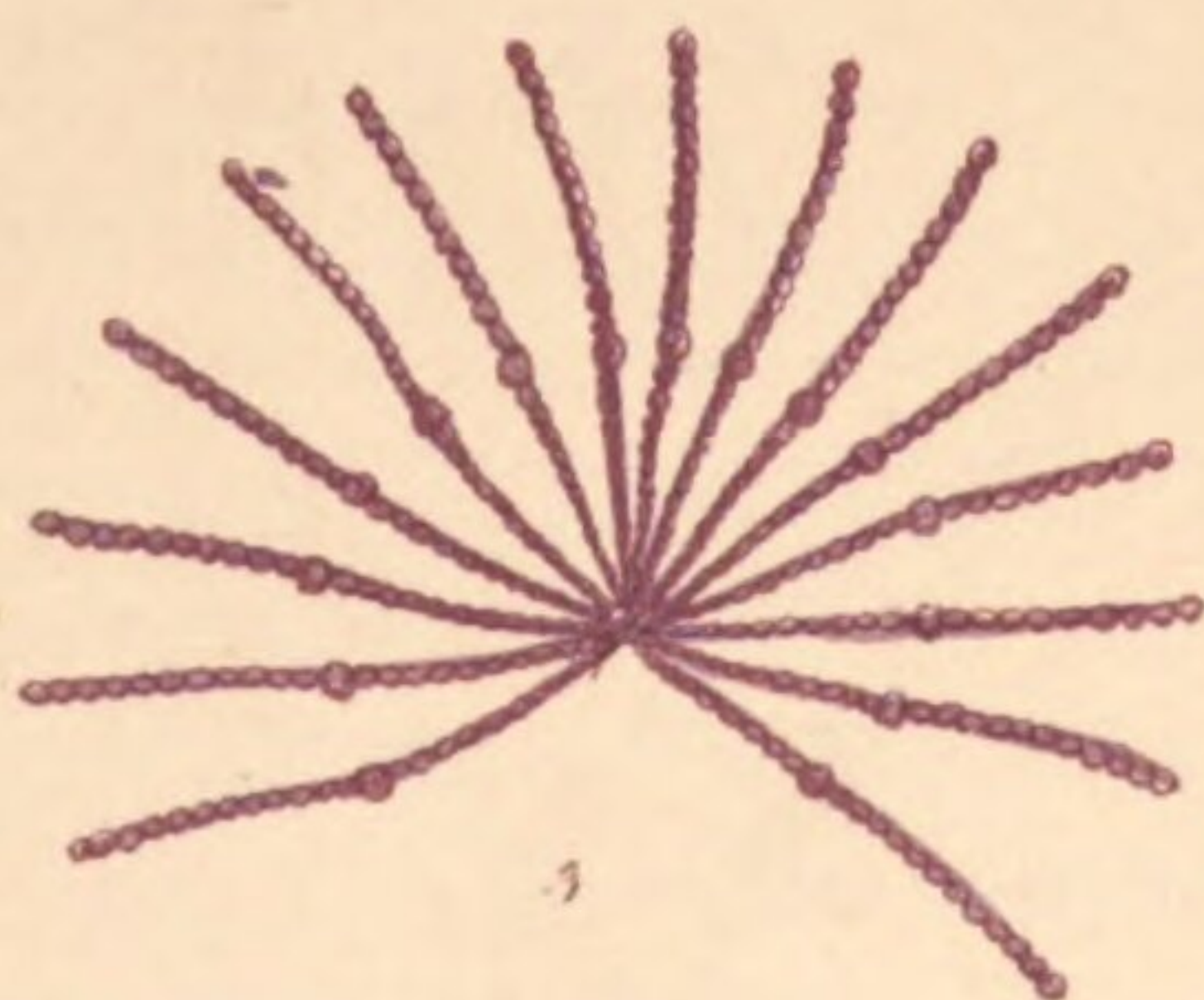
Fig. 1. CATENELLA OPUNTIA :—of the natural size. 2. Fronds. 3. A joint bearing a *ceramidium*. 4. *Ceramidium* cut open. 5. Spores, from the same. 6. Longitudinal section of the frond. 7. Transverse semi-section, with tetraspores *in situ*. 8. A tetraspore :—all more or less highly magnified.



1.



2.



3.

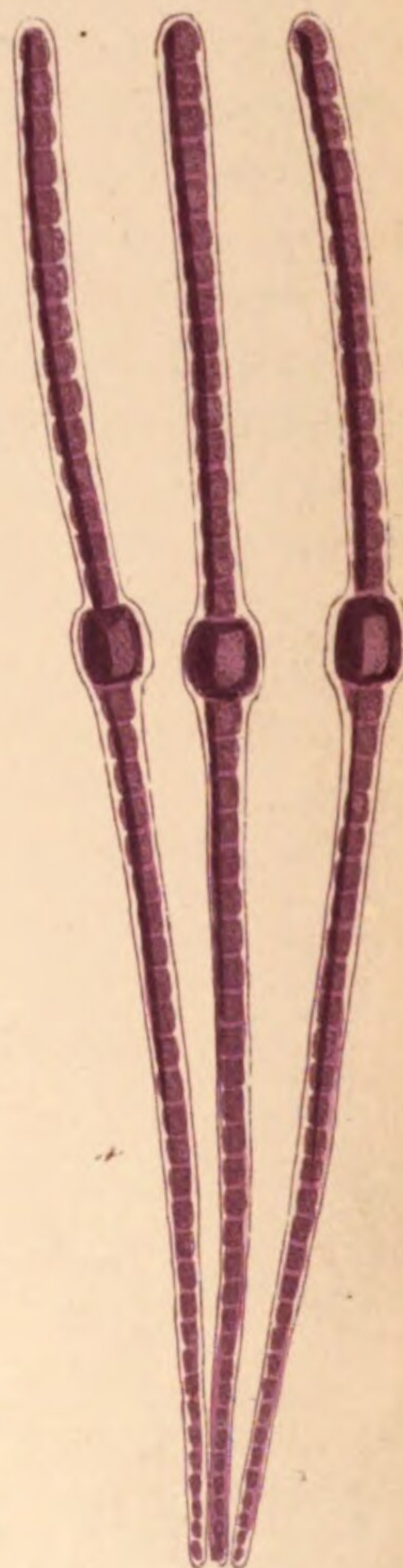


PLATE CXVII.

CRUORIA PELLITA, *Fries.*

GEN. CHAR. *Frond* gelatinoso-coriaceous, forming a skin on the surface of rocks, composed of vertical, tufted, simple, jointed filaments, set in a gelatinose matrix; one of the joints of each filament larger than the rest. *Fructification*, tetraspores lying at the base of the filaments. CRUORIA (*Fries*),—from *cruor*, *blood*; because the plant looks like a blood-stain on the rock.

CRUORIA *pellita*.

CRUORIA *pellita*, *Fries*, *Fl. Scan.* p. 316. *Endl.* 3rd *Suppl.* p. 23. *Aresch.* in *Linn.* vol. 17. p. 267.

CHÆTOPHORA *pellita*, *Lyngb.* *Hyd. Dan.* p. 193. t. 66. *Berk. Gl. Br. Alg.* t. 1. f. 3. *Harv. in Hook. Br. Fl.* vol. ii. p. 390. *Harv. in Mack. Fl. Hib.* part 3. p. 223. *Harv. Man.* p. 123. *Fl. Dan.* t. 1728.

CHÆTODERMA *pellita*, *Kütz. Phyc. Gen.* p. 326.

HAB. On smooth exposed rocks and stones, between tide marks. Perennial. Fruiting in February, *Carm.* Common on the British shores, but frequently over-looked, *Appin, Capt. Carmichael.* Oban, *Rev. M. J. Berkeley.* West of Ireland, very abundant, *W.H.H.* Mounts Bay and Ilfracombe, *Mr. Ralfs.* Jersey, *Miss Turner.*

GEOGR. DISTR. Atlantic coasts of Europe, from Norway to France. Færoe Islands.

DESCR. *Fronds* spreading over the surface of naked rocks, forming smooth, glossy patches of from two to three or more inches in diameter, at first nearly circular, but becoming irregularly lobed and sinuated at the margin when old, about half a line thick, tenacious, very elastic, between gelatinous and leathery, entirely composed of vertical filaments set in a firm, transparent jelly. *Filaments* fasciculate, perfectly simple, jointed, appearing, under a low power, moniliform, owing to the extreme transparency of their tube, composed of numerous joints filled with dense, coloured matter; joints about equal in length and breadth. Near the centre of every filament a large cellule occurs, thrice the diameter of the rest, but seemingly not otherwise differing, which, perhaps, performs some important office in the economy of the plant, though its functions are wholly unknown. *Fructification* (which I have not seen), apparently very rare, consisting of obovate clavate tetraspores, lodged at the base of the filaments. *Colour* of the frond a brownish red, or sometimes greenish or variously clouded with olive; of the filaments, under the glass, a pale or purplish-red.

Where a considerable surface of naked and smooth rock is exposed between tide marks, it may commonly be observed to be covered here and there with skin-like patches of a dull red

or olive green, formed by the plant here figured, which adheres so closely to the surface of the rock that it can only be removed in flakes by scraping with a knife. It was first noticed on the shores of Norway and the Fœroe Islands, and has since been found in many places along the Atlantic coasts of Europe, and probably exists in many others where hitherto it has been overlooked. I have vainly examined numerous specimens in search of the fructification, described by Capt. Carmichael, who discovered it after the examination of more than a hundred. The large cell near the middle of the filaments, which I find on my specimens, has not been noticed by other authors who have described or figured the plant, yet it constitutes a very remarkable feature. Possibly it may not be always so obvious. It is hard to say whether it has any connection with the fructification, or what peculiar function it may perform in the economy of the plant, but it appears to have at least an analogical resemblance to what are called *connecting cells* in *Sphærozyga*, the office of which is equally doubtful. It can have no relation to the spores described by Carmichael, which would appear to be formed from an alteration of the whole filament; not from a solitary joint. Whether it undergoes any change at a later period has not been observed.

Fig. 1. CRUORIA PELLITA, growing on a piece of rock :—*of the natural size*. 2. Portion of a vertical section of the stratum. 3. Tuft of filaments removed and opened. 4. Some of the filaments separated :—*more or less highly magnified*.

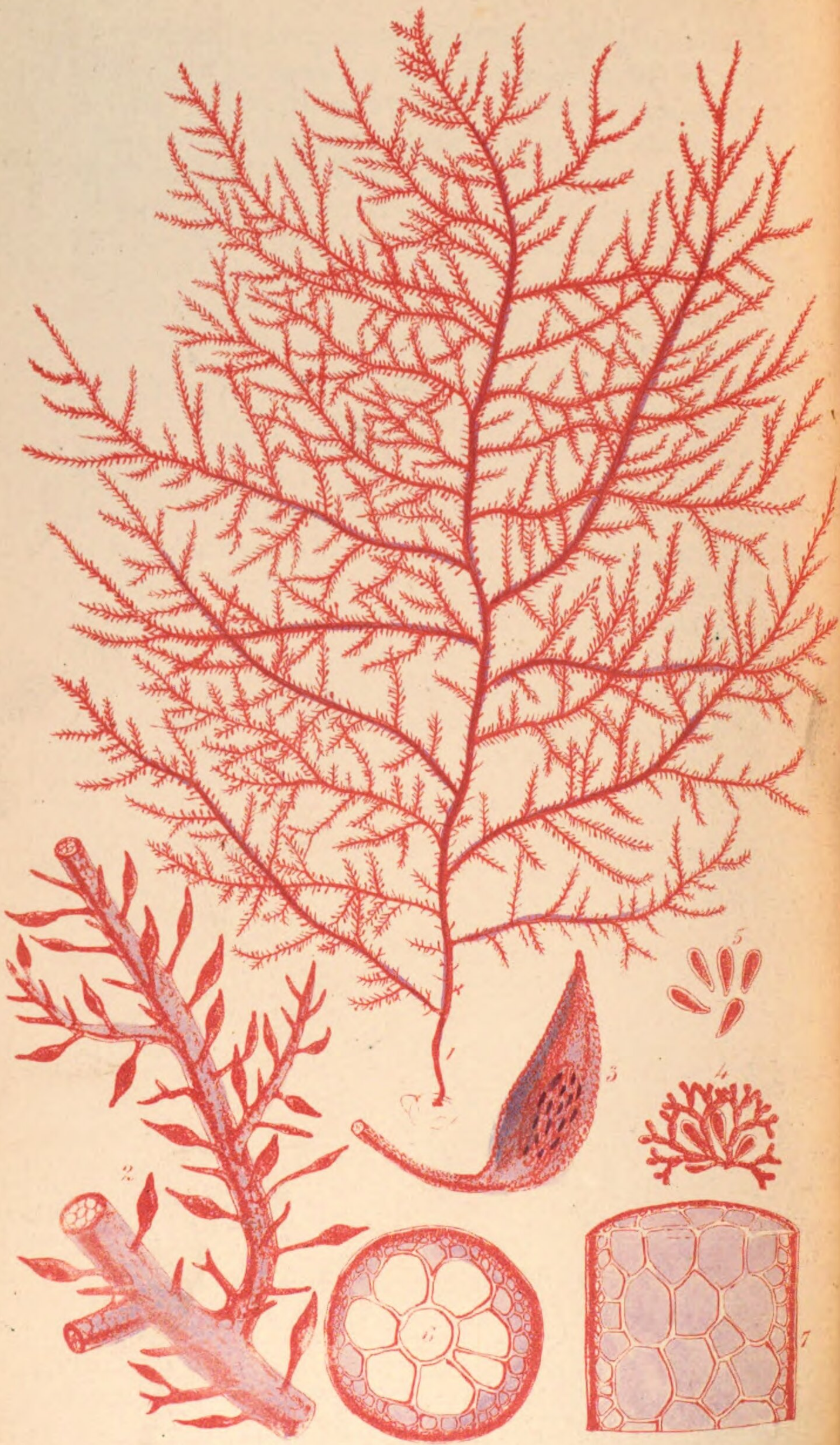


PLATE XXXVIII.

NACCARIA WIGGHII, *Endl.*

GEN. CHAR. *Fronde* cylindrical or flat, filiform, solid, rose-red; central cellules large, empty; those of the surface minute. *Ramuli* composed of jointed, dichotomous, verticillate filaments. *Fructification*; groups of spores (*favellidia*) contained in swollen ramuli. NACCARIA (*Endl.*) —in honour of *F. L. Naccari*, an Italian botanist, and author of 'Algologia Adriatica', and other works.

NACCARIA *Whigghii*; frond cylindrical; branches irregular, subalternate, attenuated; ramuli spindle-shaped, quadrifarious.

NACCARIA *Wigghii*, *Endl. Gen. Pl.* no. 68. *Endl. 3rd Suppl.* p. 37. *Harv. Man.* p. 50. *J. Ag. Alg. Medit.* p. 86. *Kütz. Phyc. Gen.* p. 391.

CHÆTOSPORA *Wigghii*, *Ag. Syst.* p. 146. *Grev. Alg. Brit.* p. 153. t. 16. *Hook. Br. Fl.* vol. ii. p. 306. *Harv. in Mack. Fl. Hib.* part 3. p. 187.

FUCUS *Wigghii*, *Turn. in Lin. Trans.* vol. vi. p. 135. t. 10. *Syn. Fuc.* vol. ii. p. 362. *Hist. Fuc.* t. 102. *Sm. E. Bot.* t. 1165.

CLADOSTEPHUS *Wigghii*, *Spreng. Syst. Veg.* vol. iv. p. 347.

HAB. On marine rocks, at and beyond the extreme limit of the tides. Annual. Summer. Very rare. Yarmouth, *Mr. Lilly Wigg.* South coast of England, in several places; not unfrequent, *Mr. Borrer*, *Mrs. Griffiths*, &c. Bantry Bay, *Miss Hutchins.* Kilkee and Wicklow, *W. H. H.* Belfast Bay, *Mr. W. Thompson.* Jersey, *Miss White*, *Miss Turner.*

GEOGR. DISTR. Atlantic shores of Europe from England to Spain. Mediterranean sea, at Nice, *Risso.*

DESCR. *Root* discoid. *Fronde* 6–12 inches high, cylindrical, filiform, much branched. Main *stem* from half a line to a line in diameter below, gradually attenuated upwards, undivided, or variously cleft, or subdichotomous, beset with very numerous, quadrifarious, lateral branches. *Branches* alternate, or issuing irregularly, very various in length, simple, or slightly divided, bearing a second or third set of similar but shorter and more slender branchlets; which, including all the younger parts of the frond, are beset on all sides with minute, slender ramuli, tapering to each end, and 1–2 lines in length. The stem and branches are solid, composed internally of very large, hyaline, polygonal, cells, surrounded by others of small size, and a periphery composed of minute cellules. The large interior cells, seen through the coat of the frond, give the surface, under a low power of the microscope, a reticulated appearance. The ramuli consist of whorls of horizontal, radiating, dichotomous, jointed filaments, closely packed together, and issuing from a slender, cellular axis. When in *fructification*, the ramuli become wider in the middle, taking a spindle shape, and *spores* of an oblong, pyriform shape, are formed at the bases of the whorled filaments. The *colour* is a brilliant, rose-red, the *substance* gelatinoso-membranaceous, and the plant adheres to paper in drying.

This charming plant, as rare as it is beautiful, was discovered

by Mr. Lilly Wigg on the Norfolk shore, about the year 1790, and first described by Mr. Dawson Turner in a paper read before the Linnæan Society in 1801. Since that period it has been detected on many different parts of the English and Irish coasts ; but not as yet, that I am aware of, in Scotland.

Some doubts respecting its true affinities have been entertained by modern systematists, but all seem now to be agreed in referring it to the neighbourhood of *Mesogloia* ; an affinity suggested by its first describer ; long neglected, and afterwards independently taken up by Mrs. Griffiths, under whose sanction I referred it in 1836 to its present position. The structure of the greater part of the frond is indeed very different from that of the *Gloiocladeæ*, the peripheric filaments which form so remarkable a feature in that family, being wholly wanting in the stem and branches ; but the habit and gelatinous substance are very similar, and the structure of the ultimate ramuli agrees very nearly with that of the whole frond of *Mesogloia*.

In the Mediterranean it appears to be of as unfrequent occurrence as on the British shores, and has only, as yet, been found by M. Risso. A second species of the genus, *N. Schousboei*, J. Ag., is found on the shores of Morocco ;—it is said to have flat, many times pinnated fronds.

Fig. 1. *NACCARIA WIGGHII* :—*natural size*. 2. Part of a branch. 3. One of the fruiting ramuli. 4. Filaments of which this is composed, with spores *in situ*. 5. Spores removed. 6. Transverse section of the stem. 7. Longitudinal section of the same :—*all magnified*.

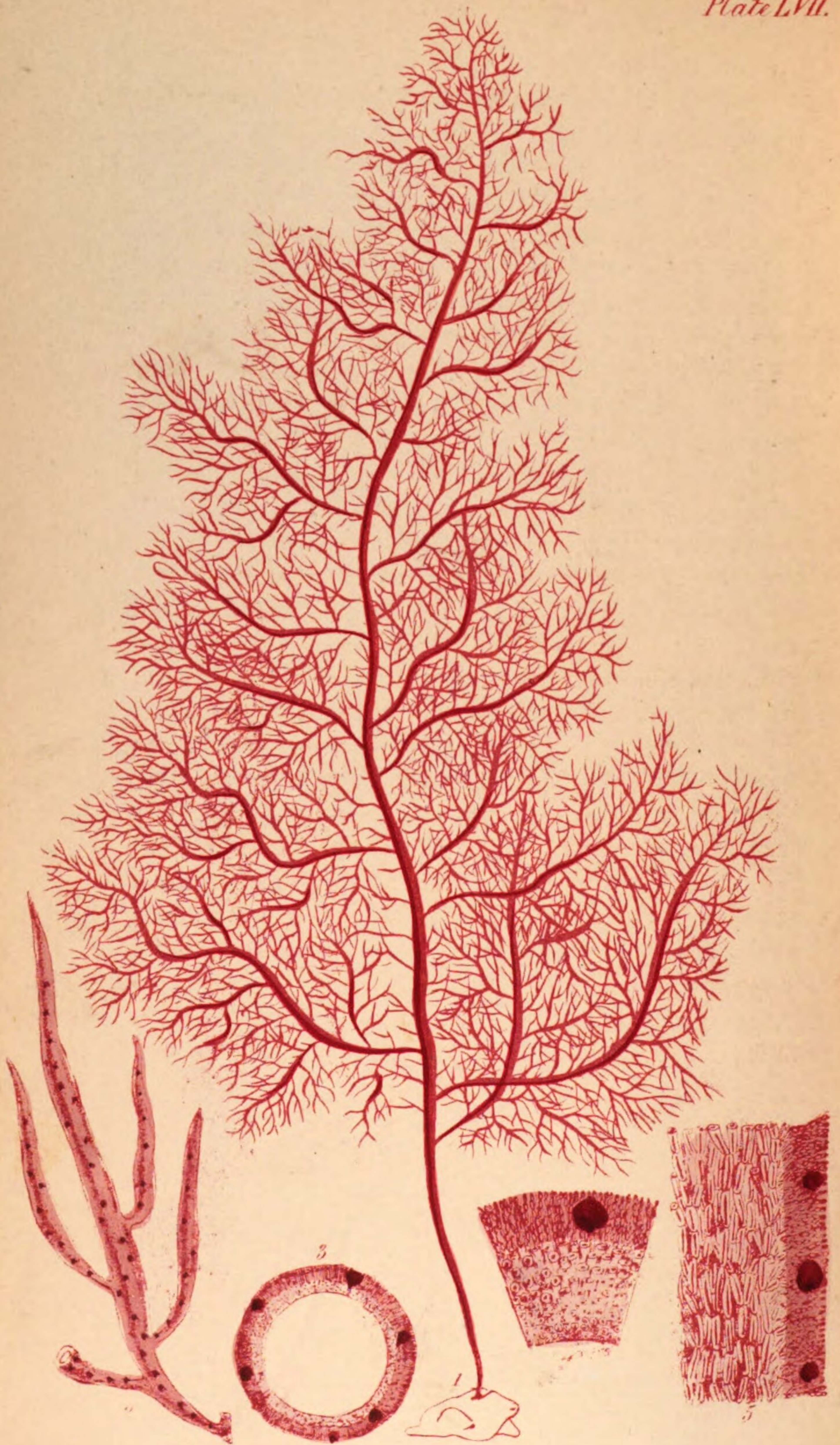


PLATE LVII.

GLOIOSIPHONIA CAPILLARIS, *Carm.*

GEN. CHAR. *Frond* cylindrical, tubular, gelatinous; the periphery composed of a thin stratum of longitudinal, interlaced fibres, clothed externally with short, horizontal, branched, moniliform filaments. *Fructification* spherical masses of spores (*favellidia*), immersed in the moniliform filaments, to whose bases they are attached. GLOIOSIPHONIA (*Carm.*)
—from γλοιός, *viscid*, and σίφων, a *tube*.

GLOIOSIPHONIA capillaris.

GLOIOSIPHONIA capillaris, *Carm. Alg. Appin. MS. Berk. Gl. of Br. Alg.* t. 17. f. 3. *Harv. in Mack. Fl. Hib.* part 3. p. 187. *Harv. Man.* p. 49. *Mc'Calla, Alg. Hib.*

MESOGLOIA capillaris, *Ag. Syst.* p. 51. *Harv. in Hook. Br. Fl.* vol. ii. p. 386.

GIGARTINA capillaris, *Lamour. Ess.* p. .

GIGARTINA lubrica, *Lyngb. Hyd. Dan.* p. 45. t. 12 (*Sec. Ag.*).

FUCUS capillaris, *Huds. Fl. Ang.* p. 591. *With.* vol. iv. p. 115. *Turn. Syn.* vol. ii. p. 370. *Hist.* t. 31. *E. Bot.* t. 2191.

HAB. On submarine rocks, growing in tide-pools, near low-water mark; frequently cast on shore from deeper water. Annual. Summer. At Sheerness, and in Devonshire and Cornwall, *Hudson*. Scarborough, *Sir T. Frankland*. Anglesea, *Rev. H. Davies*. Sidmouth and Meadfoot, *Mrs. Griffiths*. Bantry Bay, *Miss Hutchins*. Appin, *Captain Carmichael*. Glenarm, *Dr. Drummond*. Roundstone Bay, *Mr. Mc'Calla*. Howth and Balbriggan, *Miss Gower*. Saltcoats, on shale, *Rev. D. Landsborough*. Arran, *D. Landsborough, Jun.* Mount's Bay, *Mr. Ralfs*. Falmouth, *Miss Warren*. Jersey, *Miss White* and *Miss Turner*.

GEOGR. DISTR. Atlantic shores of Europe, from Norway to Spain.

DESCR. *Root* a small disc. *Fronds*, several from the same base, from three to twelve inches in length, cylindrical, varying in diameter from a quarter of a line to a line and upwards, rising with an undivided stem which is thickest in the middle and gradually tapers to either end, being reduced at its apex to a capillary fineness. The stem is generally bare of branches for a short space above its base, varying in different specimens from half an inch to an inch and a half. From this point to its summit it is closely clothed with lateral branches, several times compounded until the ultimate ramuli are reduced to small setaceous processes. The lower branches are longest, the upper gradually diminishing in length and in composition, and the outline is consequently ovate-oblong. All are more or less quadrifarious, giving a bushy character to the frond, and all taper at the base and are attenuated at the apex. They are either opposite or alternate. The *frond* is tubular, either empty or filled with a watery gelatine. Its walls are composed of closely interwoven, branching, longitudinal fibres, through whose joints runs a

very narrow, coloured bag, and they are clothed externally with a pile of short, dichotomous, moniliform coloured filaments, which form the coat of the frond. *Fructification*; spherical masses of closely compacted, minute spores, abundantly scattered among the filaments of the periphery. *Colour* a fine, clear, rosy-crimson. *Substance* tender, slippery and gelatinous, very closely adhering to paper in drying.

A highly beautiful plant, nearly related in affinity to the genus *Dudresnaia*, but, according to the views of the late Captain Carmichael of Appin, forming the type of a separate genus, which differs from *Dudresnaia* chiefly in having a tubular axis. The structure, as seen by the microscope, is very beautiful, and such that it is impossible to do it justice in drawing, the extreme lubricity and transparency of the parts being lost in a lithograph. The whole plant is very tender, and invested with a gelatinous pellicle, and each filament of which it is composed stands separated from its neighbour by a similar coating. These characters are lost in our plate, which is, in other respects, a faithful portrait.

Gloiosiphonia capillaris is one of those species which is rather uncertain in its appearance, being found in some seasons in considerable plenty, and not occurring again, sometimes, for several years. The causes of such temporary disappearances of certain sea plants are very obscure, and will probably long remain so. The most probable seem to be changes which may take place in the bottom of the sea by the shifting of sand or gravel, an overflowing of which would smother the vegetation, and would not afford sufficient stability for the roots of a new crop. In many instances this cause no doubt prevails. In some others, the difference of temperature, small as this is, of different seasons, appears to be the chief, or the only, cause of failure.

Fig. 1. *GLOIOSIPHONIA CAPILLARIS*:—*natural size*. 2. A small branchlet. 3. Transverse section of the tubular frond. 4. A segment of the same, enlarged. 5. A longitudinal section of the frond:—*all more or less highly magnified*.



PLATE XXXVI.

NEMALEON MULTIFIDUM, *J. Ag.*

GEN. CHAR. *Fronde* cylindrical, gelatinoso-cartilaginous, elastic, solid; *axis* columnar, dense, composed of closely packed, longitudinal, interlaced filaments; the *periphery* of elongated, horizontal, dichotomous filaments, whose ultimate ramuli are moniliform and coloured. *Fructification*; globular masses of spores (*favellidia*), attached to the filaments of the periphery. NEMALEON (*Tozzetti*.)—from *νήμα*, a thread, and *λήιον*, a crop; crop of threads.

NEMALEON *multifidum*; frond dichotomous, slightly branched, dull purple; the axils rounded.

NEMALEON *multifidum*, *J. Ag. in Linnæa*, vol. xv. p. 453. *Endl. 3rd Suppl.* p. 37.

MESOGLOIA *multifida*, *Ag. Syst.* p. 50. *Berk. Alg. t.* 16. f. 1. *Harv. in Hook. Br. Fl.* vol. ii. p. 385. *Mack. Fl. Hib.* part 3. p. 185. *Wyatt. Alg. Danm.* no. 98. *Harv. Man.* p. 47. *Mont. Pl. Cell. Canar.* p. 189.

MESOGLOIA *Balani*, *Carm. MSS.*

CHORDARIA *multifida*, *Lyngb. Hyd. Dan.* p. 51. *Fl. Dan.* t. 1669.

CHÆTOPHORA *multifida*, *Hook. Fl. Scot.* part 2. p. 76.

RIVULARIA *multifida*, *Web. et Mohr. Roth. Cat. Bot.* vol. iii. p. 335.

HELMINTHORA *multifida*, *Kütz. Phyc. Gen.* p. 391. t. 44. f. 3.

Var. β , *simplex*; frond simple or nearly so.

NEMALEON *lubricum*, *Duby. ? et Auct.*

HAB. On rocks, *Balani*, and shells (frequently on *Mytilus rugosus*), near low-water mark, in exposed situations. Common along the western shores of Scotland and Ireland. Downshire, *Mr. Templeton*. Torquay *Mrs. Griffiths*. Falmouth, *Miss Warren*. Balbriggan, *Miss Gower*. Var. β , at the Land's End, *Mr. Ralfs*.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean sea. Canary Islands, *Webb*.

DESCR. *Root* a fleshy, expanded disc. *Fronde*s dull purplish brown, 3–10 inches long, 1–2 lines in diameter, cylindrical, very elastic, firmly gelatinous or somewhat cartilaginous, generally forked near the base, and repeatedly forked at long intervals upwards, but varying much in the degree of furcation. *Axils* all remarkably wide, and rounded; apices but slightly tapered, blunt. *Axis* about one fourth of the diameter of the frond, very dense, compared by *Agardh* to a column, and by *Carmichael* to a "medullary cord", composed of closely adherent slender filaments, from which issue the long, horizontal, dichotomous filaments of the periphery, whose lower ramifications are colourless, with subcylindrical joints; their upper, and terminal, coloured and beautifully beaded. Occasional reflexed, root-like

ramuli or processes may be observed on the peripheric filaments. *Favellidia* dark red, globose, seated among the beaded apices, composed of innumerable angular spores. In var. β , the frond is either quite simple, or merely forked at the base.

This plant, which is found on most of the rocky shores of Europe, and probably identical with the Mediterranean species which I have ventured to unite with it, was first described by Weber and Mohr in their 'Travels in Sweden'*, and soon afterwards taken up by Roth in his 'Catalecta Botanica'. It occurs in considerable plenty on our western shores, growing near low water mark, either on the bare rocks, or on shells attached to them; and generally in situations where it is exposed to the air for a few hours, and at the same time subject to be lashed by the waves. Mr. Thompson, on the contrary, finds it at Newcastle, Co. Down, growing in very shallow *tide-pools* on granite rocks, and there only.

Except in the degree of ramification, it has no varieties: and characters, drawn from the more or less frequently forked frond, can scarcely, I fear, be depended upon; for in the same locality I have found a very considerable difference in this respect. Mr. Ralfs observes that at the Land's End the specimens are either quite simple, or merely forked at the base; and these we regard as being identical with the Mediterranean *N. lubricum*. Again, I possess a specimen from the Mediterranean marked *N. lubricum* by Professor J. Agardh, which is repeatedly dichotomous. I confess that I am at a loss to see on what characters authors contend for the existence of two species. There is no difference of structure that I can perceive, and it would seem that ramification is equally disregarded as a character by Agardh, as by myself. The specimens here figured represent the usual size and degree of branching which the plant attains on the west coast of Ireland; Scotch and Baltic specimens are often much more divided, more slender, and of smaller stature.

Fig. 1. NEMALEON MULTIFIDUM, growing on *Mytilus rugosus*:—*natural size*.
2. Filaments of the periphery, with a small portion of the axis. 3, 4. Side and front views of the favellidium, surrounded by beaded filaments.
5. Spores:—*all magnified*.

* 'Reise durch Schweden'.



PLATE CLXI.

NEMALEON? PURPUREUM, *Chauv.*

GEN. CHAR. *Fronde* cylindrical, gelatinoso-cartilaginous, elastic, solid; *axis* columnar, dense, composed of closely-packed, longitudinal, interlaced filaments; the *periphery* of elongated, horizontal, dichotomous filaments, whose ultimate ramuli are moniliform and coloured. *Fructification*; globular masses of spores (*favellidia*), attached to the filaments of the periphery. NEMALEON (*Tozzetti*),—from *νημα*, a *thread*, and *ληιον*, a *crop*: *crop of threads*.

NEMALEON *purpureum*; stem undivided, attenuated at base and apex, set with numerous, irregularly inserted, elongated, simple, tapering branches, which are either naked, or furnished with a second series of similar branches.

NEMALEON *purpureum*, *Chauv. mem.* p. 57.

MESOGLOIA *purpurea*, *Harv. in Hook. Br. Fl.* vol. ii. p. 386. *Harv. Man.* p. 48. *Wyatt, Alg. Danm.* no. 47.

DUMONTIA *Calvadosii*, *Lamour. Dict. D'Hist. Nat.* vol. v. p. 643. *Gaill. Dict. Sc. Nat.* vol. 53. p. 364. *Duby, Bot. Gall.* p. 941.

HAB. In sandy places, among *Zostera*, near low-water mark. Annual. Summer. Rare. Sidmouth and Torquay, *Mrs. Griffiths* and *Miss Cutler*. Whitsand Bay, *Rev. W. S. Hore*. Kilkee and Miltown Malbay, *W. H. H. Balbriggan*, *Miss Gower*.

GEOGR. DISTR. Atlantic coasts of France.

DESCR. *Root*, a minute, conical disc. *Fronde* from eight inches to two feet or more in length, slender at the base, gradually widening to a diameter of two to three lines in the middle, and thence gradually tapering upwards into a long, slender point, mostly undivided, or sometimes forked or trifurcate at the extremity, set throughout its length with alternate or opposite irregularly inserted lateral branches. *Branches* closely placed, patent, constricted at base, flexuous, very long, drawn out into a long, slender point, generally quite naked, or, in large specimens, furnished with a second series of smaller and more slender branches. All the apices much attenuated and acute. The *axis* is composed of rather laxly interwoven, colourless, branching, longitudinal threads, which throw out on all sides to the circumference, horizontal, dichotomous, coloured, moniliform filaments, with elliptical or pyriform joints. Under the microscope, the branches appear as if thickly studded with convex, coloured cells, (the apices of the filaments of the periphery,) separated by pellucid spaces. *Colour* varying from a fine deep purple red to a dull pink, rapidly given out in fresh water, and becoming browner in drying. *Substance* tender, gelatinous, and slippery, but not very elastic. *Fructification* (imperfectly known), consisting of masses of spores, seated among the filaments of the periphery.

M. Chauvin of Caen, in his excellent "*Recherches*," * gives a

* RECHERCHES sur l'organisation, la fructification, et la classification de plusieurs genres d'Algues, avec la description de quelques espèces inédites ou peu connues.—Caen, 1842.

history of this plant, from which it appears that it was known to the naturalists of France under the name of *Dumontia Calvadosii*, long before it was noticed on the shores of the British Islands. I was not aware of this fact, when, in 1832, I described, under the name of *Mesogloia purpurea*, specimens which were collected by Mrs. Griffiths, in the autumn of 1828, at Sidmouth. The resemblance to *Dumontia* is only an outward one; the structure is completely that of the *Gloiocladieæ*, and not very unlike that of *Mesogloia vermicularis*, though, according to our present systematic arrangement, these plants belong to different genera, and even to different families. In altering the genus of this plant, M. Chauvin had the option of restoring the specific name under which it was first described, but he has not thought fit to do so.

The *structure* of this species differs considerably from that of *N. multifidum* (already figured at Plate XXXVI.), and probably may justify the future formation of a genus, when the fructification of both plants shall be more perfectly known. In our *N. purpureum*, the axis is composed of much more laxly set filaments; while those of the periphery are less branched, shorter, and composed of very large, pear-shaped cells. Seen under a lens of low power, the branches appear like tubes of glass, densely covered with brilliant purple studs.

Nemaleon purpureum is a rare species on the British shores, though occasionally thrown up in considerable quantities. This occurred at Sidmouth when Mrs. Griffiths first found the plant, but for several succeeding years it did not make its appearance. The specimens then collected were also of a much brighter colour, as well as larger and more luxuriant, than any which have been sent to me from other stations, or than I have myself gathered. I once found it growing on sandy ground near low-water mark; but it is more usually seen among rejectamenta after a gale.

Fig. 1. NEMALEON? PURPUREUM:—*of the natural size.* 2. Portion of a branch:—*moderately magnified.* 3. Some of the filaments, composing the same:—*highly magnified.*

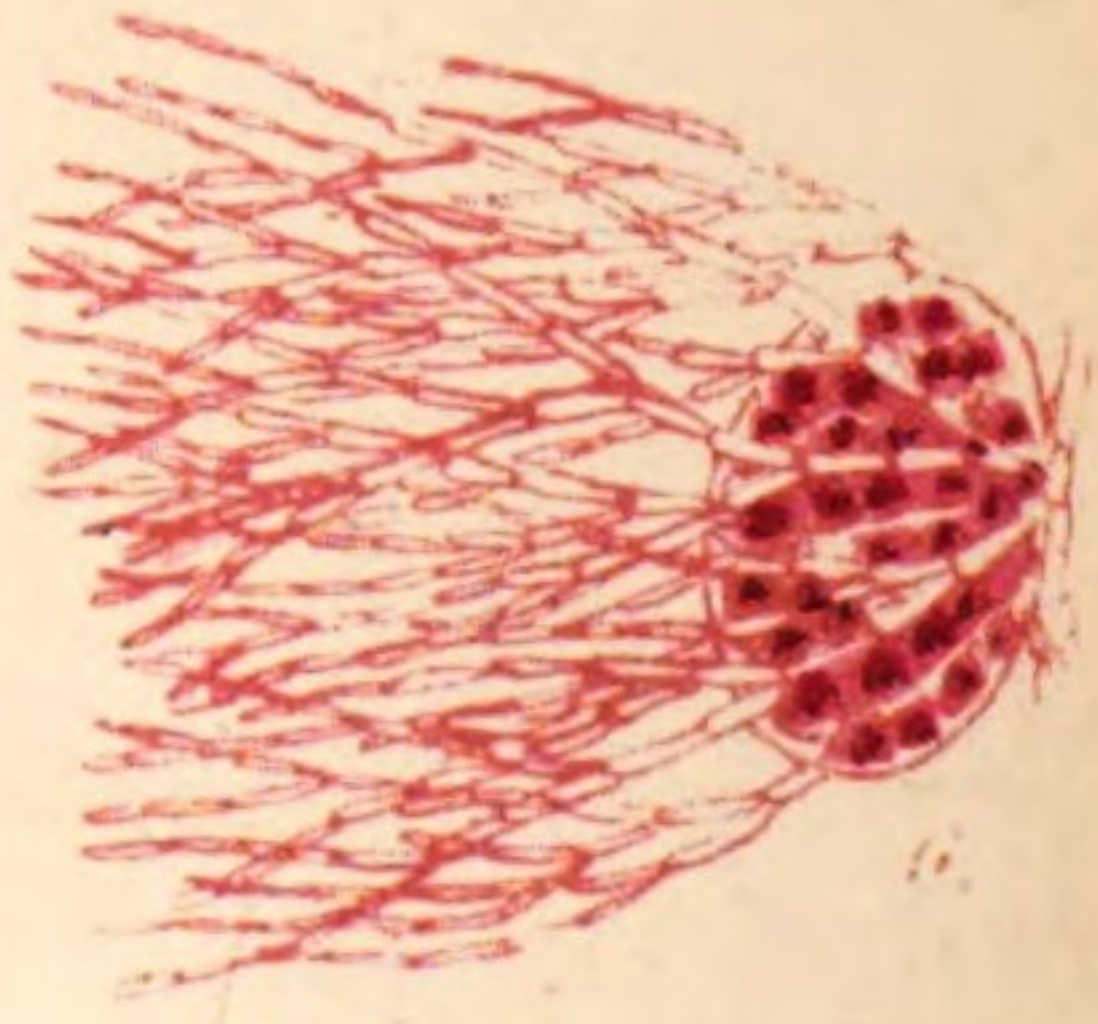
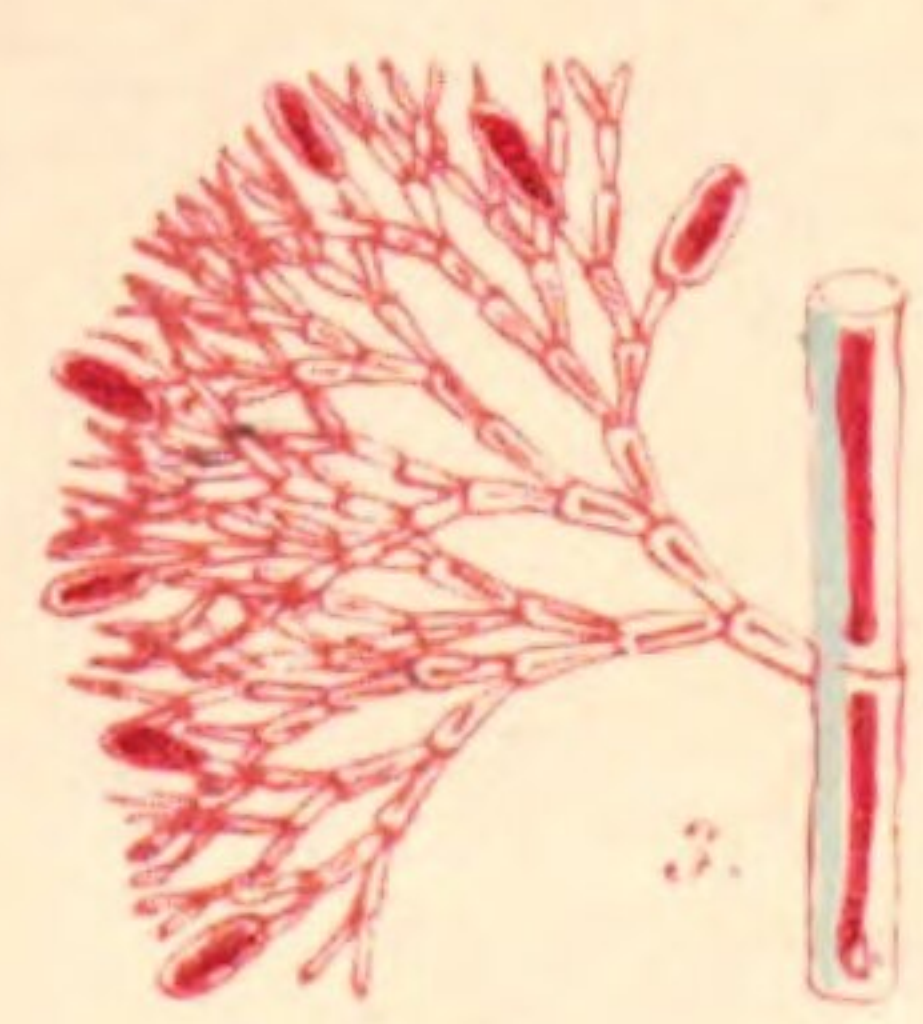
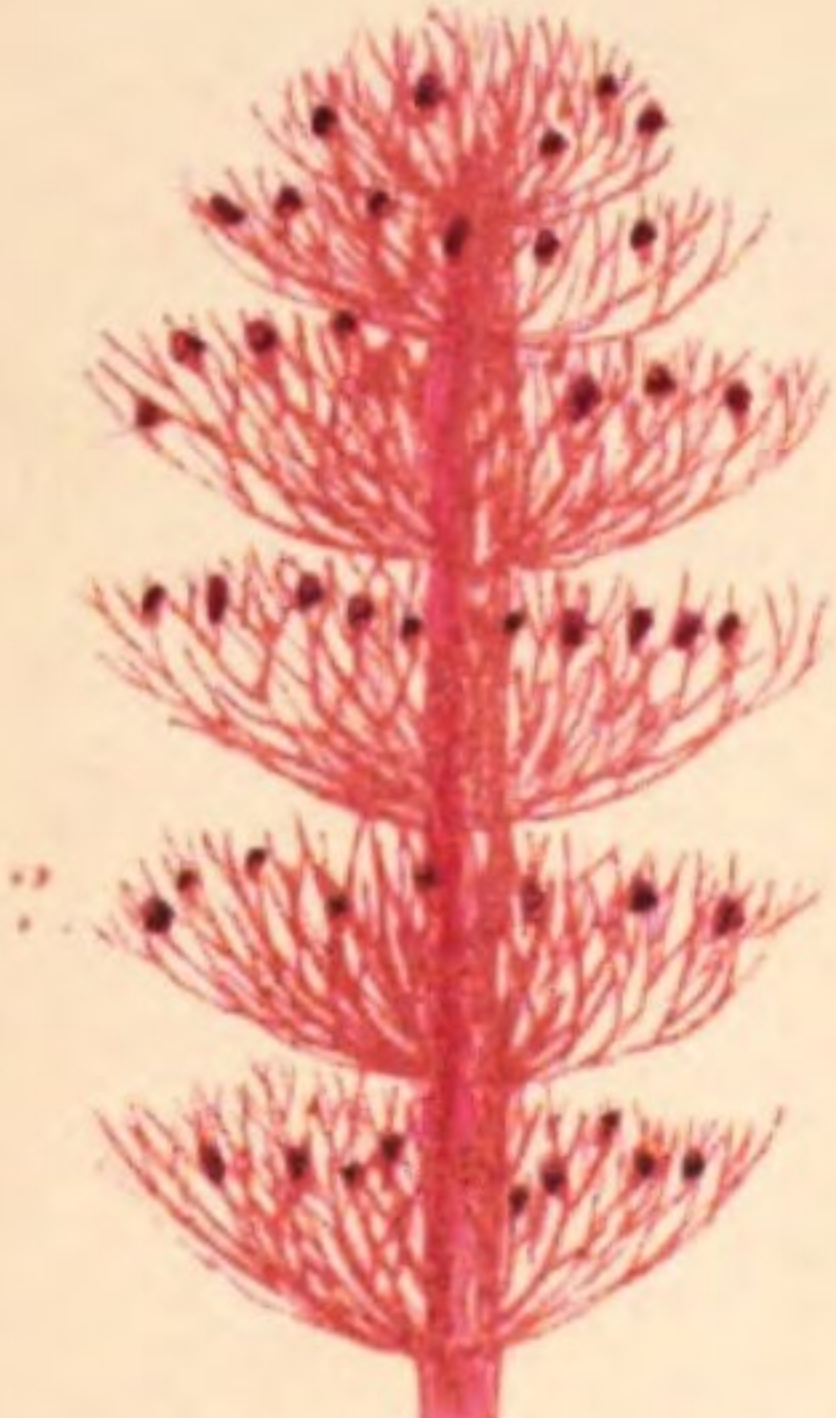


PLATE CCXLIV.

DUDRESNAIA COCCINEA, *Bonnem.*

GEN. CHAR. *Fronde* cylindrical, gelatinous, elastic; *axis* composed of a lax net-work of anastomosing filaments, coated with a stratum of closely combined, longitudinal fibres; the *periphery* of horizontal, dichotomous, moniliform filaments. *Fructification*, of two kinds, on different individuals; 1, globular masses of *spores* (*favellidia*) attached to the filaments of the periphery. 2, external zoned *tetraspores*, borne on the filaments of the periphery, generally terminating a ramulus. DUDRESNAIA (*Bonnem.*),—in honour of *M. Dudresnay*.

DUDRESNAIA *coccinea*; frond rosy red, tender and gelatinous, much and irregularly branched; branches alternate, flexuous, moniliform, attenuated upwards; ramuli more or less numerous.

DUDRESNAIA *coccinea*, *Bonnem. in Journ. Phys.* vol. xciv. p. 180. *Crouan, Nouv. Ann. Sc. Nat.* vol. iii. p. 98. t. 2. f. 3-4. *J. Ag. Alg. Medit.* p. 84. *Endl. 3rd Suppl.* p. 37.

MESOGLOIA *coccinea*, *Ag. Syst.* p. 51. *Hook. Br. Fl.* vol. ii. p. 386. *Wyatt, Alg. Damn.* no. 148. *Harv. in Mack. Fl. Hib.* part 3, p. 186. *Harv. Man.* p. 48.

RIVULARIA *verticillata*, *E. Bot.* t. 2466.

HAB. On rocks &c., near low-water mark; or, more generally, in 4-10 fathom water. Annual. Summer. Very rare. Brighton, *Mr. Borrer*. Sidmouth and Torquay, *Mrs. Griffiths* and *Miss Cutler*. Salcombe, *Mrs. Wyatt*. Plymouth, *Rev. W. S. Hore*. Falmouth, *Miss Warren*. Jersey, *Miss White* and *Miss Turner*. Bantry Bay, *Miss Hutchins*.

GEOGR. DISTR. Atlantic coasts of France.

DESCR. *Root*, a very small, conical disc. *Fronde* from six to ten inches high, much branched and bushy: sometimes with a single stem closely set with lateral branches, sometimes divided near the base into several stems. *Stem* or its divisions, set with alternate, patent branches, the lowest of which are longest, the upper gradually shorter. These bear a second and a third, and in luxuriant specimens a fourth series of smaller branches and ramuli; each series being more and more slender, and the last about as thick as bristles. In some specimens the branches and ramuli are very dense, in others they are distant and bare. In the young frond the axis is a simple, articulated filament giving off at its joints whorls of dichotomous, moniliform ramuli; but as it advances in age the central filament or axis divides into several, or others grow round it, and the whorls are much more densely set. Thus in young plants the branches appear moniliform like those of a *Batrachospermum*; but in old plants they are cylindrical. *Favellidia* large, lodged at the base of dense, much divided ramuli. *Tetraspores* transversely four-

parted, oblong, terminating the branches of the horizontal ramuli. *Colour*, a brilliant crimson, given out in fresh water. *Substance* gelatinous. The frond adhering closely to paper in drying.

One of the rarest of the British Algæ, scarcely known except on the southern shores of England, and there only in a few stations, and nowhere in great abundance. Perhaps one cause of its comparative rarity is its place of growth. Being a deep-water species it is rarely found except when cast ashore after a gale, or when sought by dredging. In the former case the specimens are frequently very flaccid, and faded in colour. I am not aware of its having been found in Ireland except, many years ago, by Miss Hutchins.

There is considerable difference in structure and also in appearance between young and old plants. In the former the axis is a simple, jointed filament, not very unlike that of a *Griffithsia*, whorled at short intervals with beaded fibres. But as the plant increases in age, the axis becomes more compound until it consists of a bundle of closely packed filaments; and then the branches become thicker and more cylindrical. *Favellidia* are commonly produced in abundance. *Tetraspores* are much more rare.

Fig. 1. DUDRESNAIA COCCINEA:—*of the natural size*. 2. Portion of a young branch, with tetraspores. 2. Ramulus from the same. 4. Tetraspores and portion of ramulus. 5. Portion of branch with favellæ. 6. Favella and ramuli from the same:—*all magnified*.

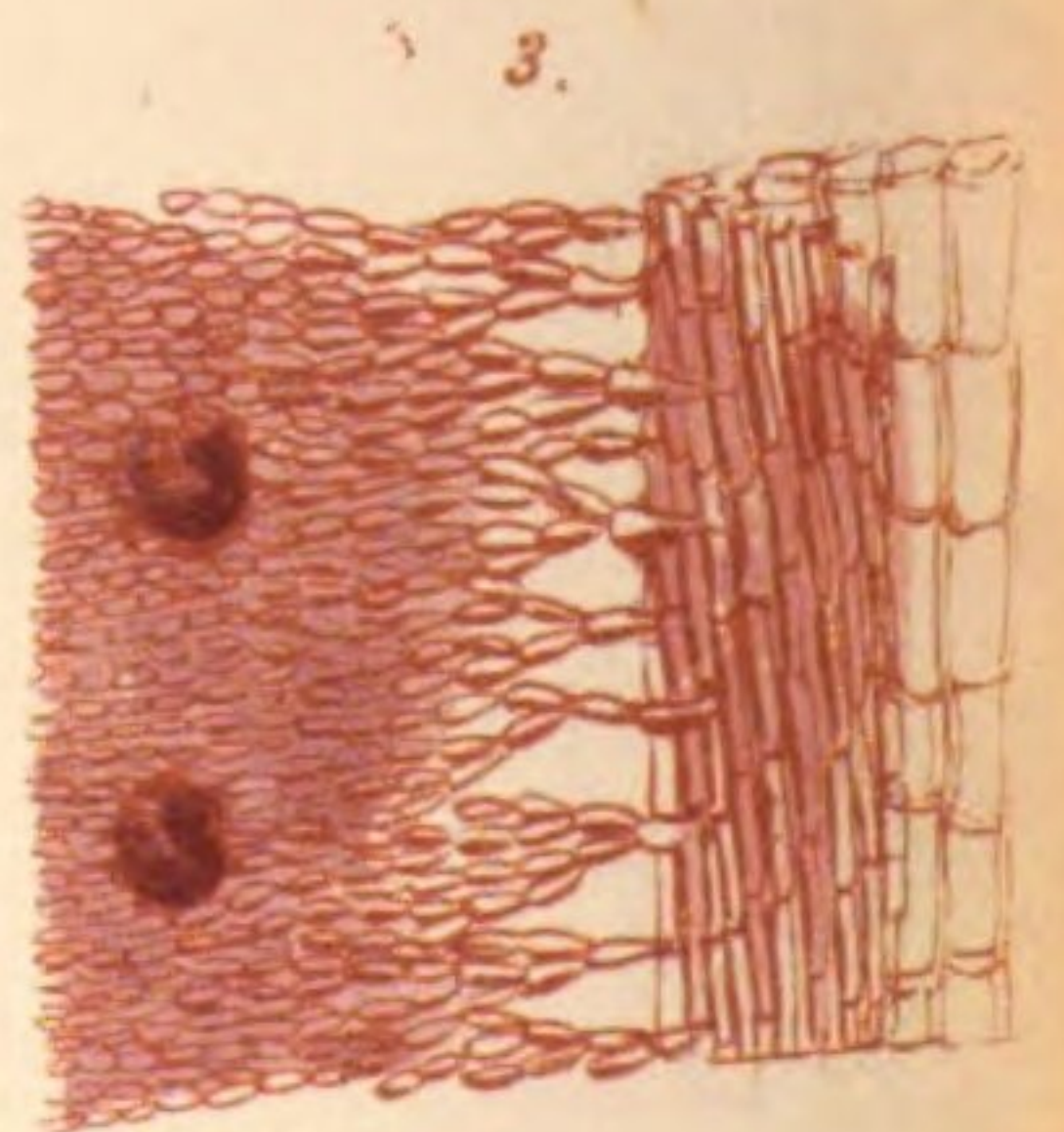
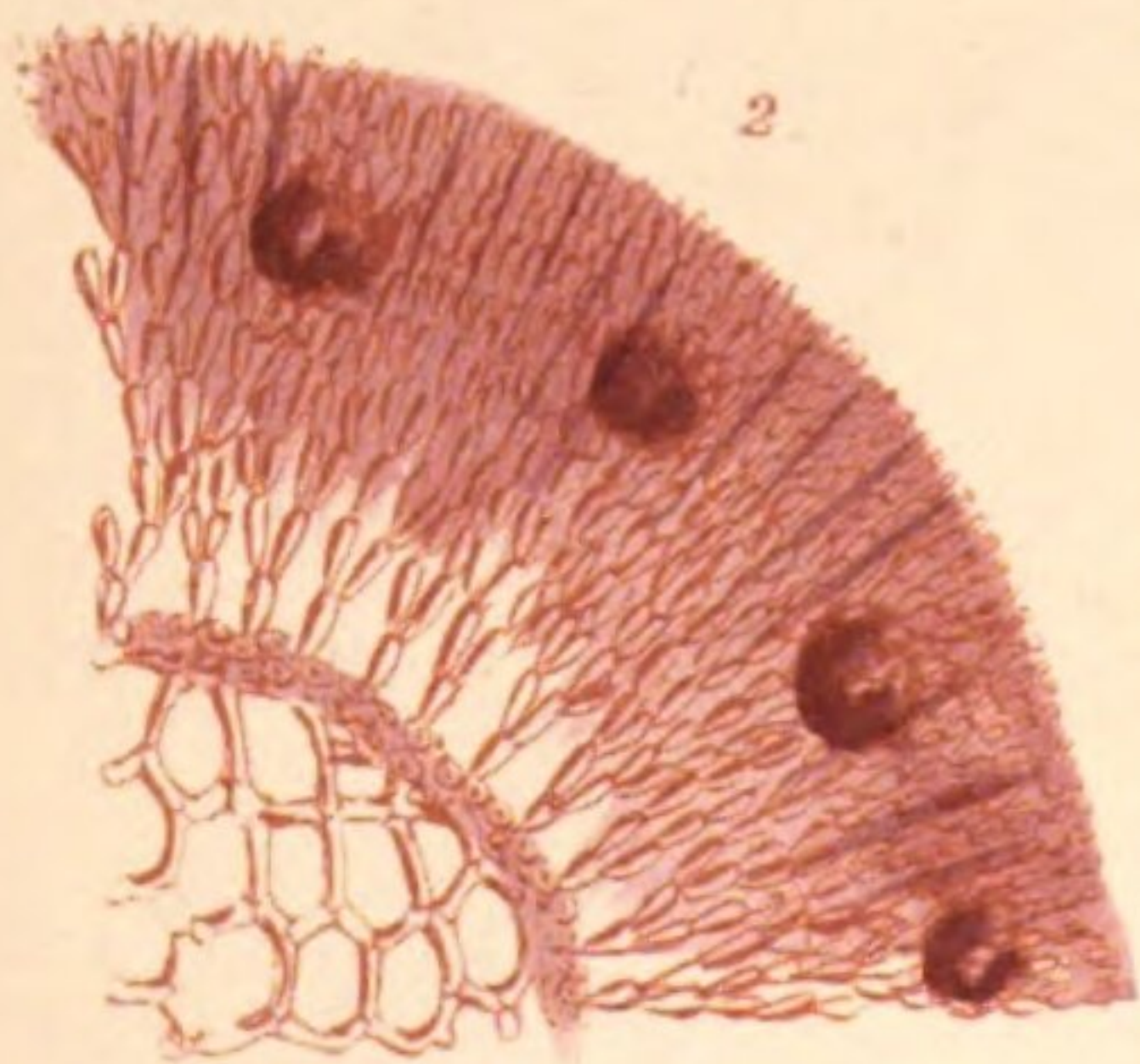
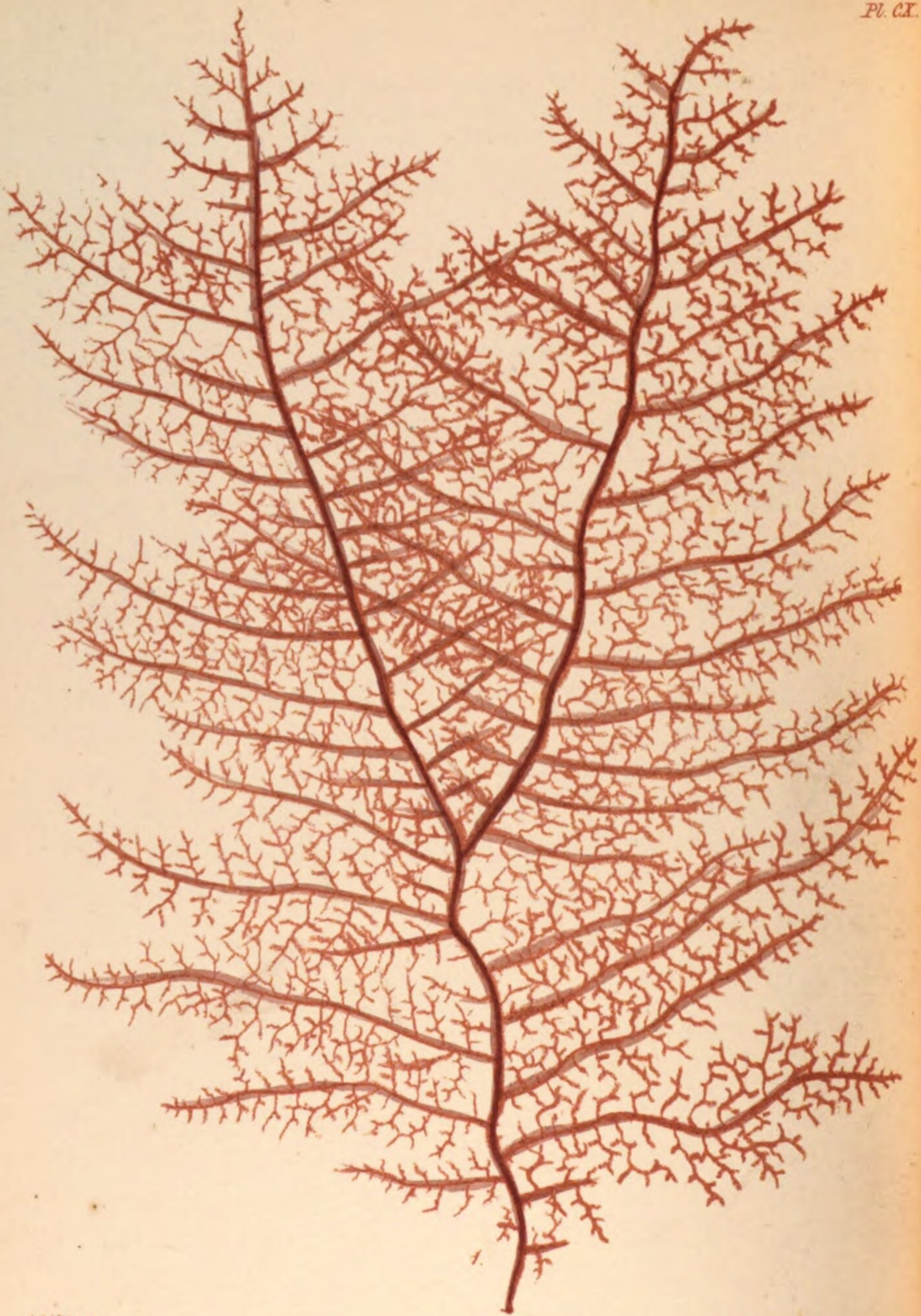


PLATE CX.

DUDRESNAIA DIVARICATA, *J. Ag.*

GEN. CHAR. *Frond* cylindrical, gelatinous, elastic; *axis* composed of a lax net-work of anastomosing filaments, coated with a stratum of closely combined, longitudinal fibres; the *periphery* of horizontal, dichotomous, moniliform filaments. *Fructification*, of two kinds on different individuals; 1, globular masses of spores (*favellidia*) attached to the filaments of the periphery. 2, external *tetraspores*, borne on the filaments of the periphery, generally terminating a ramulus. DUDRESNAIA (*Bonnem*)—in honour of *M. Dudresnay*.

DUDRESNAIA *divaricata*; frond filiform, pale red, very much branched; branches opposite or alternate, horizontal, once or twice pinnated; ramuli numerous, divaricate, irregular, obtuse.

DUDRESNAIA *divaricata*, *J. Ag. Alg. Medit.* p. 85. *Endl. 3rd Suppl.* p. 37.

MESOGLOIA *divaricata*, *Ag. Syst. Alg.* p. 51. *Kütz. Phyc. Gen.* p. 332.

MESOGLOIA *Hudsoni*, *Harv. in Hook. Br. Fl.* vol. ii. p. 386 (*not of Ag.*).
Harv. in Mack. Fl. Hib. part 3. p. 186. *Wyatt, Alg. Danm.* no. 99. *Harv. Man.* p. 47.

ULVA *rubens*, *Huds. Fl. Ang.* p. 571.

HAB. On stones, and the smaller Algæ, near low-water mark, and at a greater depth. Annual. Summer and autumn. Generally distributed round the British shores; more abundantly in the north. *Lossiemouth, Mr. Brodie. Appin, Capt. Carmichael. Arran and Salt-Coats, Rev. D. Landsborough. Orkney, Rev. J. H. Pollexfen, Lieut. Thomas, and Dr. Mc'Bain. Sidmouth and Torbay, Mrs. Griffiths. Falmouth, Miss Warren. Jersey, Miss White. Aberfaw, Mr. Ralfs. Killiney and Kilkee, W. H. H. Howth, Miss Gower. North of Ireland, Mr. Thompson. Roundstone Bay, Mr. Mc'Calla.*

GEOGR. DISTR. Northern Atlantic, as far south as the French shores of the British Channel. Baltic Sea.

DESCR. *Root* minute. *Fronds* densely tufted, 6–8 inches long, or more, about half a line in diameter, preserving an equal thickness throughout, with a simple or forked main stem, densely clothed with lateral branches. Lowest branches longest, the rest gradually shorter towards the apex, so that the outline is pretty regularly ovate, all very patent, horizontal or divaricate, in some specimens pretty regularly alternate, in others generally opposite, flexuous, pinnate or bi-pinnate, with divaricating lesser branchlets. *Ramuli* numerous, filiform, squarrose. *Substance* firmly gelatinous and elastic. *Colour* a pale red, or red-brown, becoming darker in the herbarium. *Favellæ* very commonly produced, imbedded in the whorled filaments of the periphery, to which they are attached. *Tetraspores* I have never seen.

This species is well known to British botanists as the *Mesogloia Hudsoni*, of the 'British Flora', and is, I have little doubt, the plant intended by Hudson, under the name *Ulva rubens*; his description "U. gelatinosa filiformis ramosissima rubescens, ramis sparsis horizontalibus obtusis", being strictly applicable. But it is not the plant called *Mesogloia Hudsoni* by Agardh, which it seems, is merely a variety of *Halymenia ligulata*; and it unquestionably is the species long known on the Continent under the name *Mesogloia divaricata*, and recently admitted into the genus *Dudresnaia*; a genus typified by *Mesogloia coccinea* and its allies. Though I consider it probable that Hudson was the original observer, still, as a doubt rests on his synonyme, I here adopt the modern name, given by Agardh, because it is that in common use, except in Britain.

It is still a question whether this plant really belongs to the genus *Dudresnaia*, and not rather to *Nemæleon*. If we judge it by outward habit it will be placed in the former; but there is certainly an approximation in structure to the latter, although the axis is less dense and somewhat differently constructed. The fructification is imperfectly known. I have sought in vain among a large number of specimens, from different localities, for tetraspores. Mrs. Griffiths has been equally unsuccessful. Nor has M. Chauvin, on the coast of Normandy, been more fortunate. All the specimens we have independently examined, produce *favellidia*, which appear to be formed in abundance on every full-grown plant. As this is also the case with *Nemæleon multifidum*, it may be questioned whether it would not be more correct to place *D. divaricata* in the same genus.

Dudresnaia divaricata abounds throughout the Northern Atlantic, gradually diminishing to the south of the British Islands. It has not been found in the Mediterranean.

Fig. 1. *DUDESNAIA DIVARICATA*:—of the natural size. 2. Transverse section of a segment of the frond. 3. Longitudinal section of the same:—both highly magnified.



PLATE CVI.

CROUANIA ATTENUATA, *J. Ag.*

GEN. CHAR. *Fronde* gelatinous, filiform, consisting of a jointed, single-tubed filament, whose joints are clothed with dense whorls of minute, multifid ramelli. *Fructification*, of two kinds on distinct individuals; 1. "*Favellidia* subsolitary near the apex of the ramuli, affixed to the base of the whorled ramelli and covered by them, containing, within a hyaline membranaceous perispore a subglobose mass of minute spores". 2. Obovate *tetraspores* of large size, affixed to the bases of the ramelli.—CROUANIA, (*J. Ag.*), in honour of the Brothers Crouan, of Brest, celebrated among French Algologists.

CROUANIA *attenuata*.

CROUANIA *attenuata*, *J. Ag. Alg. Medit.* p. 83. *Endl. 3d. Suppl.* p. 36.

MESOGLOIA *attenuata*, *Ag. Syst.* p. 51.

MESOGLOIA *moniliformis*, *Griff. in Wyatt, Alg. Danm.* No. 197. *Harv. Man* p. 49.

GRIFFITHSIA *nodulosa*, *Ag. Sp. Alg.* vol. ii. p. 136.

CALLITHAMNION *nodulosum*, *Kütz. Phyc. Gen.* p. 373.

BATRACHOSPERMUM *attenuatum*, *Bonnem.*

HAB. Parasitical on the smaller *Algæ*. Annual. Summer. Very rare. On *Cladostephus spongiosus* at Salcombe Bay, *Mrs. Wyatt*. Mouse-hole near Penzance, *Mr. Ralfs*.

GEOGR. DISTR. Mediterranean and Adriatic Seas. Atlantic Coast of France, very rare. South Coast of England.

DESCR. *Fronde* densely tufted, one to two inches high, very tender and gelatinous, capillary, excessively branched, and bushy; the divisions alternate, many times divided, patent, moniliform, attenuated at the extremity. The branches consist of a jointed filament, with a very narrow endochrome, and wide limbus, from the nodes of which issue very dense, globular whorls of dichotomous, multifid ramelli. The lowermost joints of the main filament or axis are several times longer than broad; the upper ones becoming gradually shorter, and the ultimate are scarcely longer than their diameter. As each dissepiment produces its whorls, it thus happens that the lowest whorls are far asunder, the upper gradually closer together, and the ultimate ones imbricating each other. The ramelli of which the whorls consist are regularly dichotomous and fastigate. *Tetraspores* of very large size, obovate, tripartite, borne on one of the basal joints of the ramelli, sessile. *Favellæ* I have not seen. Colour a brownish or purplish red.

This beautiful little plant was first noticed by Bonnemaison, on the northern shores of France, where it appears to be of as rare

occurrence as it is in England. Subsequently, Agardh detected it in both the Adriatic and Mediterranean Seas, from various localities of whose shores I have received specimens, rather more luxuriant than our British plants, but not affording any essential distinctions. Mrs. Wyatt was the fortunate discoverer in England, in the year 1838, and it was first made known to British botanists in her excellent 'Algæ Danmoniensis' under the expressive name *Mesogloia moniliformis*, which we regret cannot be preserved, owing to the prior claim of the comparatively unmeaning epithet bestowed by the first discoverer.

By Bonnemaison it was referred to *Batrachospermum*, with which genus it perfectly agrees in habit, and has many points of direct affinity, but its structure, though similar in many respects, is not identical. Agardh originally placed it in *Mesogloia*, afterwards, less happily, in *Griffithsia*. Mrs. Griffiths was the first to suggest it might prove the type of a new genus, allied on the one hand to *Dudresnaia*, on the other to *Batrachospermum*, and the younger Agardh has accordingly assigned to it the name it here bears. It must be confessed, however, that, except for the very decided gelatine, and some difference in the conceptacular fruit (as described by J. Agardh), there is little to separate it from *Callithamnion*, to which genus it is united by Kützinger. Were the ramelli opposite instead of whorled, the habit would be very similar to that of *Cal. floccosum*, and others of the same section.

Professor J. Agardh describes the '*Favellidia*' as the only fruit with which he was acquainted, but I have never found them on British specimens, on which, on the contrary, *tetraspores* are commonly formed. These last are of very large size in proportion to the size of the plant, and have a structure exactly similar to that of the tetraspores of *Callithamnion*.

C. attenuata is of extreme rarity on our coasts, having hitherto, as far as I am aware, been only found in the two stations given above.

Fig. 1. *CROUANIA ATTENUATA*, growing on *Cladostephus spongiosus*:—of the natural size. 2. A branch. 3. Portion of the stem, with a whorl. 4. A filament from the whorl, bearing a tetraspore:—all variously magnified.



PLATE LXXX.

PTILOTA PLUMOSA, *Ag.*

GEN. CHAR. *Frond* inarticulate, linear, compressed or flat, distichous, pectinato-pinnate; the pinnules sometimes articulate. *Fructification*, of two kinds, on distinct individuals; 1, *tetraspores* attached to, or immersed in the ultimate pinnules; 2, roundish, clustered, *receptacles* (*favellæ*) surrounded by an involucre of short ramuli. Ptilota (*Ag.*) —from *πτίλωτος*, *pinnated*.

PTILOTA *plumosa*; frond cartilaginous, decompose; secondary branches bi-tripinnate, elongate; pinnæ and pinnules exactly opposite, the latter subulate, cellular, traversed by a narrow, immersed, jointed filament; tetraspores on short pedicels, fringing the margin of the pinnules; flavellæ pedunculate, with an involucre of 6–8 subulate ramuli.

PTILOTA *plumosa*, *Ag. Sp. Alg.* vol. i. p. 385. (*excl. var. β.*) *Ag. Syst.* p. 195. *Lyngb. Hyd. Dan.* p. 38. t. 9. *Grev. Fl. Edin.* p. 297. *Spreng. Syst. Veg.* vol. iv. p. 344. *Hook. Fl. Scot.* part 2. p. 106. *Grev. Alg. Brit.* p. 155. t. 16. *Hook. Br. Fl.* vol. ii. p. 84. *Harv. in Mack. Fl. Hib.* part 3. p. 204. *Harv. Man.* p. 84. *Endl. 3rd Suppl.* p. 36. *Post. and Rupp.* p. 16. *Kütz. Phyc. Gen.* p. 378. t. 46. f. 6.

CERAMIUM *plumosum*, *Roth. Cat. Bot.* vol. iii. p. 133. *Ag. Dist.* p. 17.

PLOCAMIUM *plumosum*, *Lamour. Ess.* p. 50.

FUCUS *plumosus*, *Linn. Mant.* p. 134. *Syst. Nat.* vol. ii. p. 718. *Huds. Fl. Angl.* p. 587. *Gm. Hist. Fuc.* p. 152. *Fl. Dan.* t. 350. *Lightf. Fl. Scot.* vol. ii. p. 955. *With.* vol. iv. p. 120. *Esper. Ic. Fuc.* vol. i. p. 92. t. 45. *Fl. Norv.* vol. ii. p. 91. *Linn. Trans.* vol. iii. p. 188. *Turn. Syn. Fuc.* vol. ii. p. 296. *Turn. Hist. Fuc.* t. 60 (*excl. var. β.*). *Eng. Bot.* t. 1308.

HAB. Parasitical on the stems of *Laminaria digitata*. Perennial. Summer and autumn. Frequent on the shores of Scotland, and of the north and west of Ireland. Holyhead, *Mr. Ralfs*. Scarborough, —.

GEOGR. DISTR. Distributed throughout the Arctic, the North Atlantic and North Pacific Oceans. Davis's Strait, *Turner*. Iceland, *Æder*. White Sea, Greenland, Sitka, Unalaska, *Postels* and *Rupprecht*. Arctic America, *Richardson*. Kamtschatka, *Bongard*. Norway and Sweden.

DESCR. *Root* scutate. *Fronds* tufted, 4–12 inches in length, compressed, linear, from the thickness of a hog's bristle to nearly a line in diameter, irregularly divided. Secondary branches distichous, 1–3 inches in length, patent, linear-oblong or obovate in circumscription, bi-tripinnate, the pinnæ and pinnules very patent, scarcely a line asunder, gradually increasing in length toward the middle of the branch, and diminishing to the apex. Ultimate pinnules closely pectinate, awl-shaped, acute, cartilaginous, sub-opake, their outer coat formed of numerous angular cellules, through which is visible a jointed

axis or string of large cells, which runs through the pinnule as well as (with some modification) through every part of the frond. *Fructification*; 1, roundish, tripartite, external tetraspores seated on minute pedicels, which fringe the margin of slightly abbreviated pinnules; 2, on distinct plants, clustered *favellæ*, surrounded by an involucre of several subulate ramuli, and borne on the apex of abbreviated pinnules. *Colour* a dark, full red, occasionally with a brownish tinge. *Substance* cartilaginous, rather rigid, more or less perfectly adhering to paper in drying.

Our figure and description apply solely to the var. *a.* of Turner, which, though abundant on the shores of Scotland and the north and west of Ireland, is rare in England, and quite unknown on our southern shores. As far as my experience goes it invariably grows on the stems of *Laminaria digitata*, which it often clothes with a rich feathery fringe. The var. *β.* of Turner, which is the common plant of the south of England, as invariably grows on rocks; and preserves its characters so constantly that I cannot help regarding it, with Kützinger, as a distinct species. In doing so I am reluctantly compelled to dissent from the opinion of Mr. Turner, who says, "that no *Fucus* whatever exhibits more regular gradations between the most narrow and delicate, and the broadest and most cartilaginous individuals; in consequence of which no attempt was ever previously made to separate it into different varieties." I cannot observe this gradation; to me the two forms appear to be easily distinguishable by the naked eye in every case; and present very distinct microscopic characters. Besides this, their geographical range and habitat are different; for though on our northern shores both are found, yet further north the var. *a.* alone is met with; and further south, as on the southern shores of England and the shores of France and Spain, the var. *β.* is exclusively seen. Add to this, that the first is never found on rocks, and the last always is; that the parasites which commonly infest them are different; that one is a far stouter and more cartilaginous plant than the other; that the microscopic appearance of their pinnules is very dissimilar; and we shall, I think, have sufficient specific characters to separate them.

Fig. 1. *PTILOTA PLUMOSA*:—of the natural size. 2. A pectinated pinnule. 3. One of the ultimate laciniae. 4. An involucre. 5. Favellæ, removed from the same. 6. A lacinia bearing tetraspores. 7. One of the tetraspores:—more or less highly magnified.



PLATE CXCI.

PTILOTA SERICEA, *Gmel. (sp.)*

GEN. CHAR. *Fronde* inarticulate, linear, compressed, or flat, distichous, pectinato-pinnate; the pinnules sometimes articulate. *Fructification*, of two kinds on distinct individuals; 1, *tetraspores* attached to, or immersed in, the ultimate pinnules; 2, roundish, clustered *receptacles* (*favellæ*) surrounded by an involucre of short ramuli. Ptilota (*Ag.*),—from *πτίλωτος*, *pinnated*.

PTILOTA *sericea*; frond flaccid, excessively branched; secondary branches bi-tripinnate; pinnæ and pinnules exactly opposite, the latter linear, composed of a single row of cells; tetraspores on short processes of the pinnules; favellæ pedunculate, binate, naked, or surrounded with a few irregular ramuli.

PTILOTA *elegans*, *Kütz. Phyc. Gen.* p. 378.

PTILOTA *plumosa*, var. γ . *tenuissima*, *Ag. Sp. Alg.* vol. i. p. 386. *Ag. Syst.* p. 195.

PTILOTA *plumosa*, β . *capillaris*, *Grev. Alg. Brit.* p. 155. *Hook. Fl. Br.* vol. ii. p. 307. *Wyatt, Alg. Danm.* no. 77. *Harv. in Mack. Fl. Hib.* part 3. p. 204. *Harv. Man.* p. 84.

FUCUS *sericeus*, *Gm. Hist. Fuc.* p. 149. t. 15. f. 3.

FUCUS *Ptilotus*, *Gunn. Fl. Norv.* vol. ii. p. 135. t. 2. f. 15. *Esper. Ic.* p. 96. t. 46.

FUCUS *pectinatus*, *Gunn. Fl. Norv.* vol. ii. p. 122. t. 2. f. 8. *Esper. Ic.* p. 97. t. 47.

PLOCAMIUM *elegans*, *Bory, sec. Kütz.*

HAB. On the perpendicular faces of rocks, between tide marks; rarely on the stems of *Fucus serratus*. Perennial. Summer and autumn. Very common on the British shores.

GEOGR. DISTR. Atlantic shores of Europe, from Norway to France. East coast of North America.

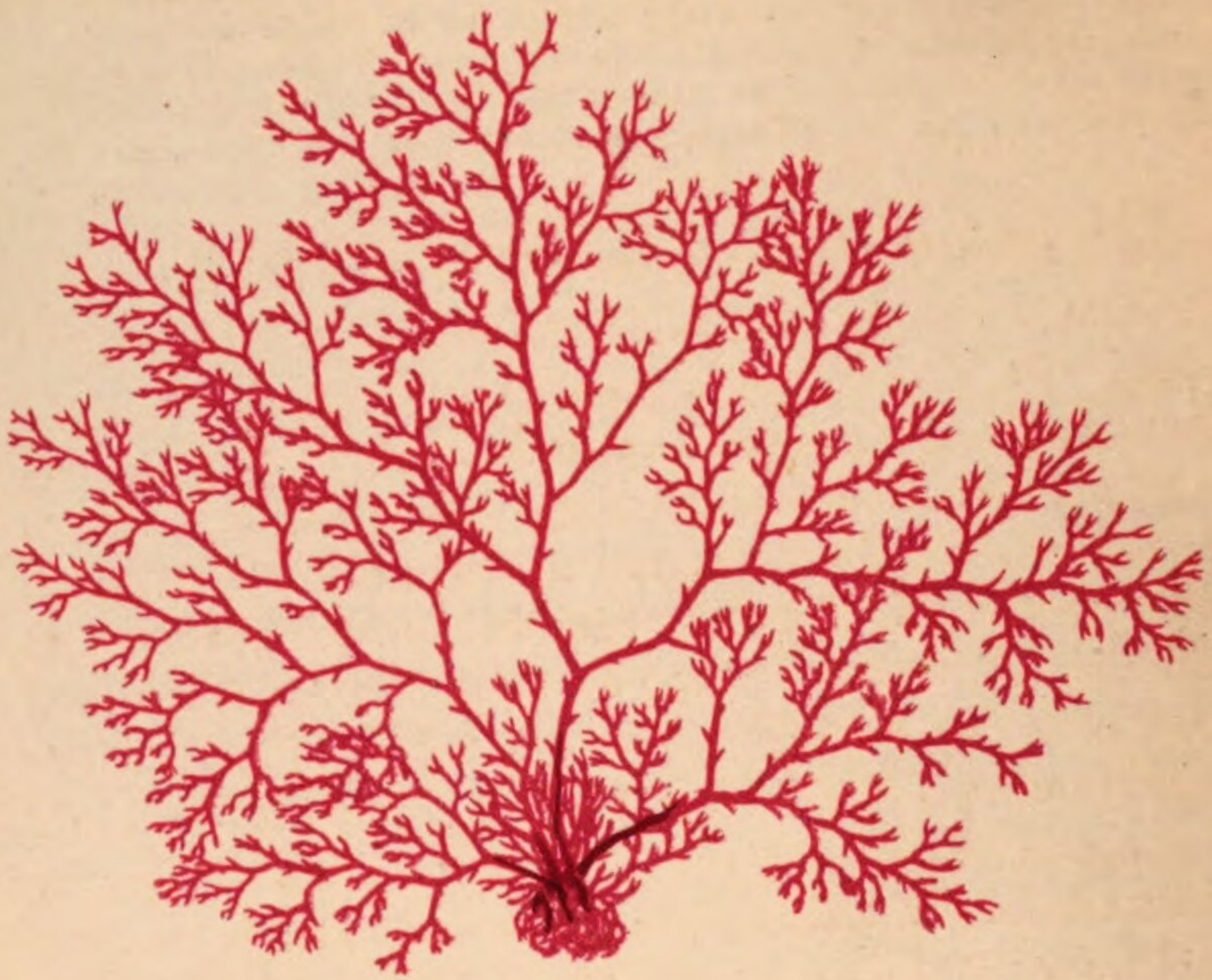
DESCR. *Root*, a small disk. *Fronde*s tufted, two to four inches long, or more, and as much in expansion, distichous, excessively branched, in a more or less regularly pinnate manner, the main divisions only being somewhat dichotomous; secondary branches elongate, repeatedly and closely pinnate, the pinnæ and pinnulæ nearly horizontally patent, of very irregular lengths, short and long being intermixed consecutively without order; the longer again and again pinnated, the shorter simple. *Ultimate pinnulæ* very closely set, those on the outer side of the pinnæ longer than the inner, linear, blunt, slightly curved, articulated, composed of a single row of quadrate cells; the older ones emitting pinnules of a second order at each joint, in which case the cells of the main pinnule acquire an invertly pyriform shape (owing to the excavation of two lateral buds). *Tetraspores* spherical, with wide borders, borne on the lateral processes of the pinnules. *Favellæ* on

the apices of shortened pinnæ, largish, binate, oval, containing many granules, naked, or surrounded by an imperfectly formed involucre of jointed ramuli. *Colour*, a very dark blackish, or brownish red; becoming pinky, after long exposure and steeping in fresh water. Under the microscope small portions have a clear, full lake colour. *Substance* very soft and flaccid, adhering to paper.

Under Plate LXXX. of the first volume, I stated my intentions to separate the form usually considered by British botanists as a variety of *Ptilota plumosa*, from that species, as has already been done by Kützinger, and I now fulfil that promise. I am compelled, however, in deference to an earlier botanist, to adopt a different specific name from that imposed by Kützinger. That our plant is really the *Fucus sericeus* of Gmelin, as well as the *F. Ptilotus* and *F. pectinatus* of Gunner, admits of scarcely a doubt. The descriptions of these authors are sufficiently full, and the figures quoted sufficiently characteristic. And I much prefer the expressive name *sericeus*, which aptly defines the soft and *silky* substance of this species, to the much more modern *elegans*, which, however applicable in the abstract, is scarcely characteristic of a plant which is probably the least elegant of the beautiful genus to which it belongs. Had I been at liberty to choose a specific name, I should certainly have proposed *rupestris* as the most characteristic.

Under *Pt. plumosa* I have already stated that our *Pt. sericea* "invariably" grows on rocks. This is using rather too strong an expression, for though it very generally does grow on rocks, it is sometimes found on several of the smaller Algæ, and therefore mere difference of habitat cannot be insisted on as one of its diagnostic characters. The true difference between *Pt. plumosa* and *Pt. sericea* must be placed in the different structure of the ramuli, these being much more simple in the present plant. Two other species, with similarly jointed ramuli, are found in the Southern Hemisphere.

Fig. 1. PTILOTA SERICEA:—of the natural size. 2. A plumule. 3. Young pinnule. 4. An older pinnule. 5. Part of a fertile pinnule, bearing tetraspores. 6. A tetraspore. 7. Pinnule with favellæ. 8. A favella:—all more or less magnified.



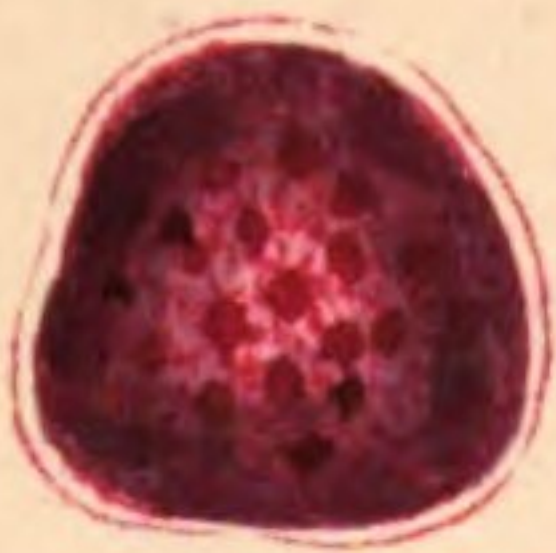
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2.



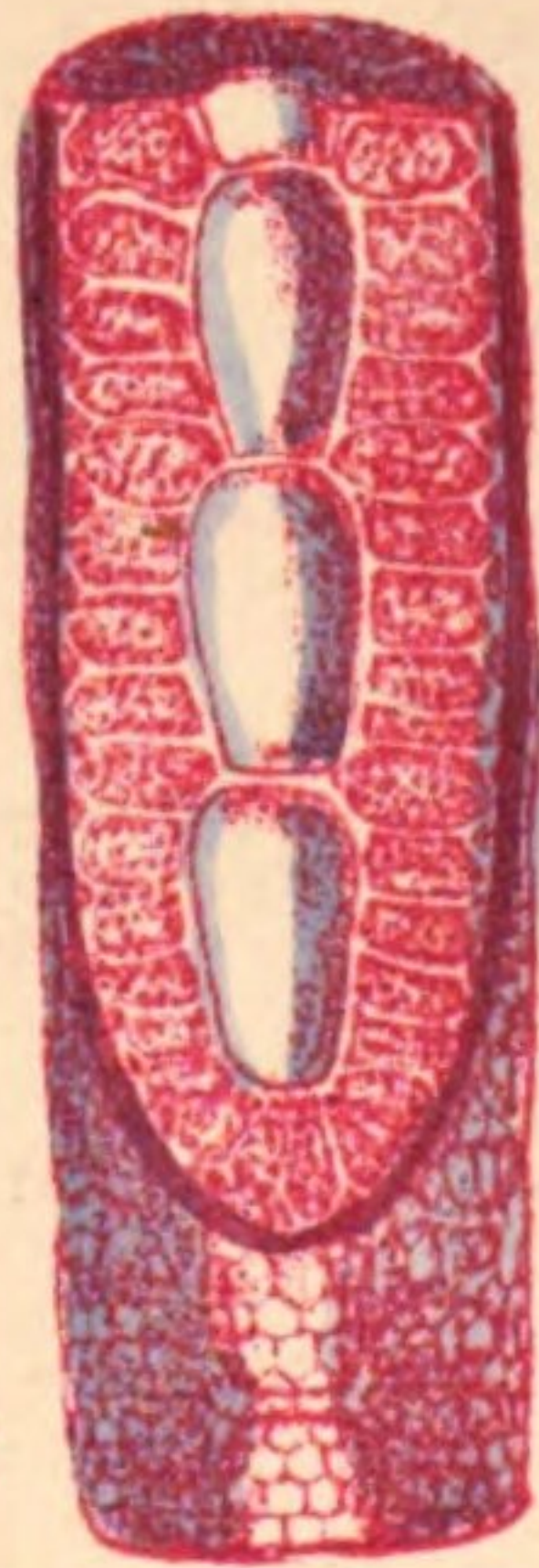
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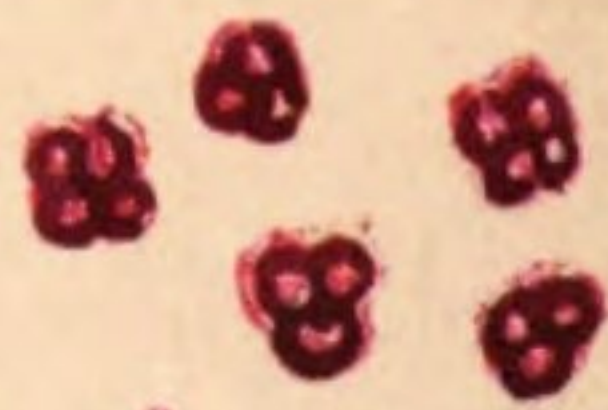
3.



4.



7.



6.



8.

PLATE XXIX.

MICROCLADIA GLANDULOSA, *Grev.*

GEN. CHAR. *Fronde* filiform, compressed, distichously branched, traversed by a wide, articulated tube, surrounded, by numerous, large, coloured, angular, radiating cells; external coat formed of minute reticulated cellules. *Fructification* of two kinds, on distinct individuals: 1, *tetraspores* immersed in the ramuli; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing numerous minute angular spores, and surrounded by several, short, simple, involucral ramuli. MICROCLADIA (*Grev.*)—from μικρός, *small*, and κλάδος, a *branch*.

MICROCLADIA *glandulosa*, *Grev.*

MICROCLADIA *glandulosa*, *Grev. Alg. Brit.* p. 99. t. 13. *Hook. Br. Fl.* vol. ii. p. 293. *Harv. Man.* p. 65. *Wyatt, Alg. Danm.* n. 68. *Kütz. Phyc. Gen.* p. 382. *Endl. 3rd Suppl.* p. 36.

DELESSERIA *glandulosa*, *Ag. Spec. Alg.* vol. 1. p. 182. *Ag. Syst.* p. 251. *Jones et Kingst. Fl. Devon.* part 2. p. 66.

FUCUS *glandulosus*, *Soland. MS. Turn. Hist.* t. 38. *E. Bot.* t. 2135.

HAB. Growing on rocks in the sea, or on Algæ, or Sponges, either near extreme low-water mark, or at a greater depth. Very rare. Annual. Summer. Budleigh Salterton, and Torquay, *Mrs. Griffiths*. Falmouth *Miss Warren*. Teignmouth, *Mr. Ralfs*.

GEOGR. DISTR. Southern shores of England. Atlantic shores of France and Spain. Marseilles, *Kützing*. Kamtschatka, *Agardh*.

DESCR. *Roots* fibrous, branching. *Fronde* tufted, one to four inches high, about a quarter of a line in width, compressed, much branched from the base in an alternate or irregularly dichotomous manner, forming roundish, fastigate tufts. *Branches* distichous, angularly zig-zag, irregularly divided, of nearly equal breadth throughout, the axils very patent, more or less furnished with short, forked or dichotomous ramuli. *Ramuli* 2–3 lines long, once, twice, or repeatedly forked, with rounded axils, and subulate or bifid apices, the points in the latter case hooked inwards. When viewed with a pocket lens of moderate power the frond appears inarticulate, but marked with large reticulations, the internal cells being seen through the semi-transparent cellules of the surface. Under a lens of greater power this appearance vanishes in a great degree, and the frond seems to be closely cellular. A transverse section (fig. 8) exhibits a wide, empty centre surrounded by several large cells filled with granular endochrome, and bounded externally by the numerous minute, much compressed cellules of the surface. A longitudinal section (fig. 7) shows us that the central tube is divided, at regular intervals, into a series of loculi or joints, separated from each other by thin, transparent diaphragms. *Colour* a fine blood or rose-red, darker towards the base, and acquiring a brownish shade in drying. *Substance* cartilagineo-membranaceous, adhering, but not closely,

to paper. *Tetraspores* sometimes cruciate, but generally triangularly divided, immersed in the ramuli, near their apices, and generally disposed in longitudinal series on the outer edge of the branchlet. *Favellæ* sessile on the outer margin of the ramuli, subglobose, or irregularly shaped, occasionally lobed, containing very numerous angular spores, and clasped by two or three short, involucreal ramuli.

We are informed by Mr. Turner, in his 'Historia Fucorum', that a specimen of this beautiful plant, of British origin, but uncertain locality, had long been preserved in the Banksian Herbarium under the MS. name *Fucus glandulosus*, but remained unpublished until Mrs. Griffiths, in September, 1803, fortunately discovered it again upon the Devonshire coast, and enabled him to figure and describe it for the first time. Since that period it has been found, as far as I am aware, in but two other British stations, and in neither of them of such large size as in Torbay. To Miss Warren of Flushing I am indebted for a great number of specimens, and to Mrs. Griffiths for the fine specimen here represented, and others in both kinds of fruit. I believe no one in Britain but Mrs. Griffiths has yet found *Favellæ*. On the continent, *Microcladia glandulosa* is decidedly rare, though found along the shores of France and Spain. Professor J. Agardh omits it in his 'Algæ Maris Mediterranei', but Kützinger has received it from Marseilles. Bishop Agardh mentions specimens from Kamtschatka, which, though somewhat different from the European plant, he considers to belong to the same species. This, if correct, is an interesting fact in the distribution of so rare a plant.

As a genus, *Microcladia* is very closely indeed allied to *Ceramium*, with which it agrees in habit, and merely differs in some minor points of structure. Some specimens of *Cer. rubrum* nearly resemble it, but the absence of external joints in the *Microcladia*, is a character sufficiently obvious to distinguish it from the *Ceramium*. *Microcladia glandulosa* is often found tangled with other Algæ, upon which it grows; and sometimes, as Mrs. Griffiths observes, creeps over them in the manner of a *Cuscuta*, throwing out root-like fibres along the branches. These adhere so strongly, that it is impossible to disengage them without laceration.

Fig. 1. MICROCLADIA GLANDULOSA:—*natural size*. 2. A branchlet with favellæ, 3. A favella removed from its involucre. 4. Spores from the same. 5. A branchlet with tetraspores. 6. Tetraspores. 7. A longitudinal section of the frond. 8. A transverse section of the frond:—*all magnified*.

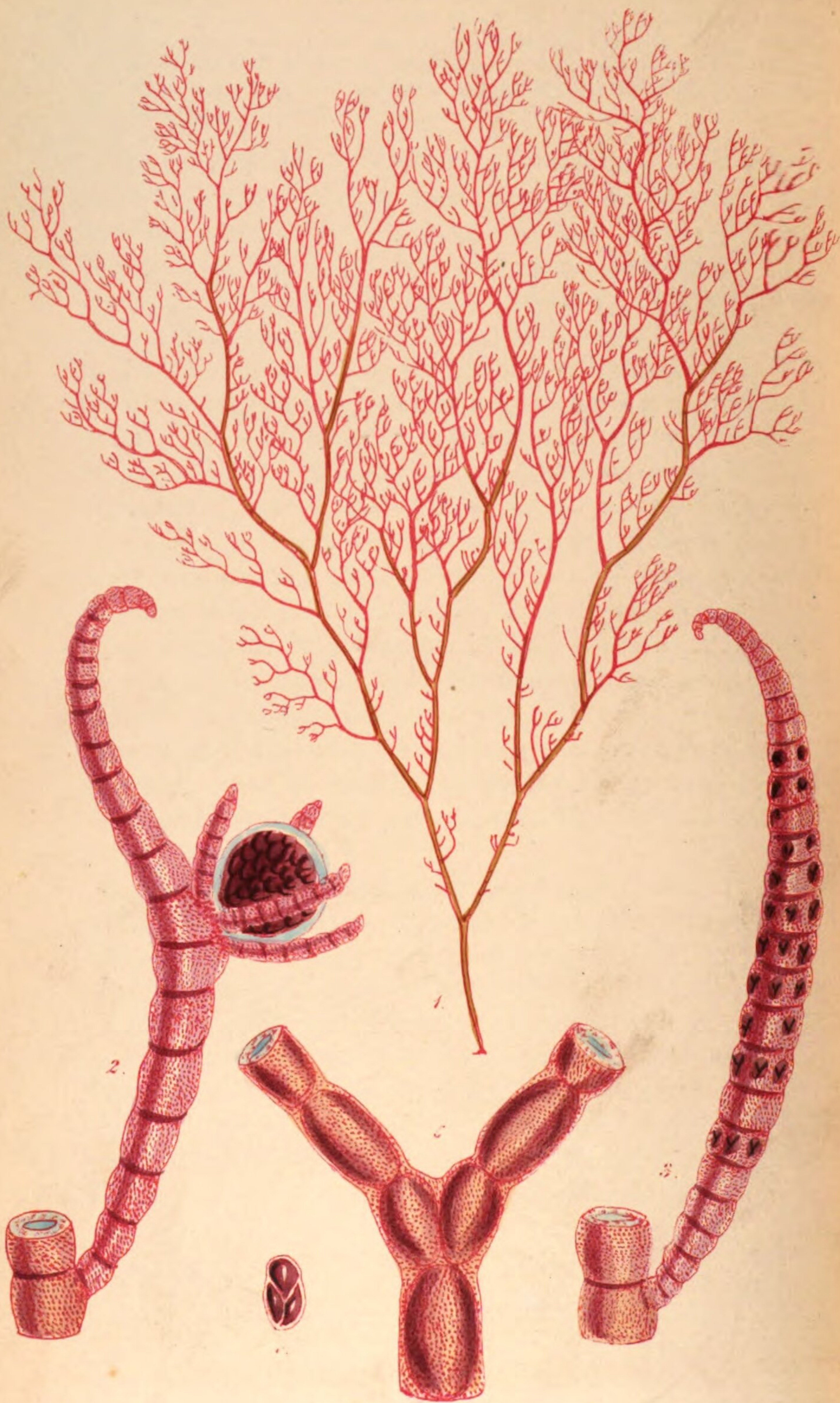


PLATE CLXXXI.

CERAMIUM RUBRUM, *Ag.*

GEN. CHAR. *Fronde* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth*),—from *κεραμος*, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *rubrum*; filaments robust, gradually attenuated upwards, irregularly dichotomous, with lateral, forked or multifid ramuli, the apices hooked inwards; articulations coated with coloured cellules, unarmed, the lowermost twice as long as broad, the upper shorter than their breadth; dissepiments constricted; tetraspores immersed in the articulations, whorled; favellæ globose, mostly borne on the lateral branchlets, subtended by three or four involucral ramuli.

CERAMIUM *rubrum*, *Ag. Syn.* p. 60. *Lyngb. Hyd. Dan.* p. 118. tab. 62. B. 1. *Hook. Fl. Scot.* part 2. p. 84. *Ag. Syst.* p. 135. *Grev. Fl. Edin.* p. 310. *Ag. Sp. Alg.* vol. ii. p. 146. *Harv. in Hook. Brit. Fl.* vol. ii. p. 336. *Wyatt, Alg. Danm.* no. 42. *Harv. in Mack. Fl. Hib.* part 3. p. 210. *J. Ag. Alg. Medit.* p. 81. *Endl. 3rd Suppl.* p. 36. *Kütz. Phyc. Gen.* p. 381.

CERAMIUM *virgatum*, *Roth, Cat. Bot.* vol. i. t. 8. f. 1. *Fl. Germ.* p. 461.

CERAMIUM *elongatum*, *Roth, Cat.* vol. ii. p. 178. *DC. Fl. Fr.* vol. ii. p. 44.

CERAMIUM *axillare*, *DC. Syn.* p. 9.

CERAMIUM *nodulosum*, *Ducluz. Ess.* p. 61. *DC. Syn.* p. 9.

CONFERRA *rubra*, *Huds. Fl. Ang.* p. 600. *With. Br. Pl.* vol. iv. p. 138. *E. Bot.* t. 1166. *Dillw. Conf.* t. 34. *Fl. Dan.* t. 1482.

CONFERRA *nodulosa*, *Lightf. Fl. Scot.* p. 994.

CONFERRA *tubulosa*, *Huds. Fl. Ang.* p. 600.

CONFERRA *flosculosa*, *Ellis. Phil. Tr.* 57. p. 425. t. 18.

Var. β . *secundatum*; lateral ramuli mostly secund.

CERAMIUM *secundatum*, *Lyngb. Hyd. Dan.* p. 119. t. 18.

HAB. Growing on rocks, stones, and the smaller Algæ in rock-pools from near the extreme of high water to low-water mark; also dredged in four or five fathoms. Annual. Summer and autumn. Very abundant on all parts of the British coasts.

GEOGR. DISTR. Abundant throughout the temperate zones of both hemispheres; also in the tropical ocean, both east and west.

DESCR. *Root* scutate. *Filaments* solitary or tufted, from one or two to twelve inches long, or more, as thick as hog's bristle, or twice as thick in the

lower part, gradually attenuated upwards, irregularly dichotomous at longish intervals, and furnished more or less copiously with lateral simple, forked, or repeatedly dichotomous ramuli: the axils patent; the apices either hooked inwards or straight. Minor characters of branches excessively variable. *Articulations* opaque, coated with a thick stratum of small coloured cells, marked (frequently) with an oval area, being an internal air-cell or tube, seen through the coat; dissepiments contracted. *Favellæ* involucrate, spherical, borne on the sides of lateral short ramuli. *Tetraspores* immersed in the substance of the articulations, several in each articulation, in a transverse line. *Colour*, where the plant is in perfection, a fine, deep, clear-red; varying to all shades of red-brown, fulvous, yellow, and even greenish, down to white. *Substance* membranaceous or cartilaginous. It more or less perfectly adheres to paper.

This plant, one of the most universally diffused of the *Florideæ*, and one of the commonest on every shore where it grows, puts on so many deceptive appearances that the young botanist and even the experienced observer are again and again deceived by it. As it grows from near the limit of high water to beyond the recess of the tide, it is exposed to a very variable amount of solar light and heat, a circumstance which at once accounts for the varieties in colour which the frond assumes. The variations in ramification depend on more hidden causes: but they are such that, however dissimilar different specimens may seem, other intermediate states may in most instances be detected which perfectly connect them. Still it is *possible* that the specific characters above given may apply to more than one species. I now allude to a virgate plant which I have hitherto regarded as a variety of *C. rubrum*, but which may ultimately, perhaps, be admitted to rank as a species, should a more definite character be discovered to distinguish it. The *Ceramia* are almost as unsatisfactory to the botanist as the *Rubi*; and their varieties quite as numerous. They are, however, very beautiful plants, and thus, in some degree, the botanist is repaid for the trouble which their investigation often occasions.

Fig. 1. CERAMIIUM RUBRUM:—of the natural size. 2. Ramulus with a favella. 3. Ramulus with imbedded tetraspores. 4. Tetraspores. 5. Portion of the main filaments:—all magnified.

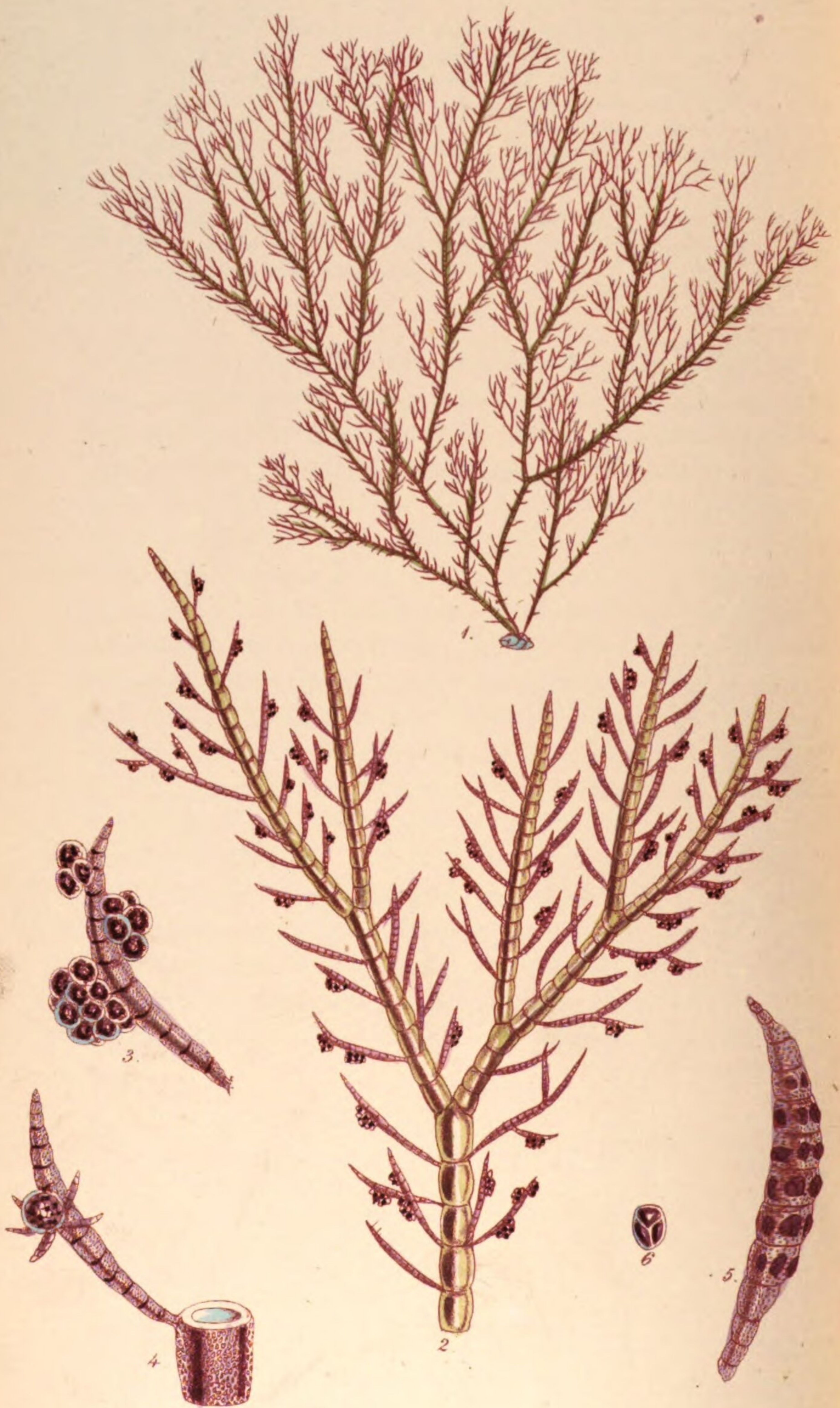


PLATE CCXV.

CERAMIUM BOTRYOCARPUM, *Griff.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores* either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth.*),—from *κεραμος*, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *botryocarpum*; filaments crooked at the base, robust, gradually attenuated upwards, irregularly dichotomous, with numerous lateral, mostly simple ramuli, the apices straight; articulations coated with coloured cellules, unarmed, the lowermost twice as long as broad, the upper shorter than their breadth; dissepiments constricted; tetraspores immersed in the articulations, whorled; favellæ globose, of small size, heaped together in irregular clusters, borne on the lateral branchlets, destitute of involucral ramuli.

CERAMIUM *botryocarpum*, *Griff. in Herb.*—*Harv. Phyc. Gen.* in list of species, vol. i. pl. xi.

HAB. On rocks and Algæ, between tide-marks. Annual. Summer. Discovered on Preston rocks, Torquay, by *Miss Amelia E. Griffiths*, (1844.) Ardrossan, *Rev. D. Landsborough*.

GEOGR. DISTR. British Islands.

DESCR. *Root* scutate, with imperfect fibres. *Stems* sharply hooked or curved at the base (not well shown in figure), thicker than hogs' bristles, gradually attenuated upwards, three to five inches long, several times branched in a more or less regular dichotomous manner, the branches erect, with sharp and narrow axillæ, the apices sometimes level-topped, sometimes of unequal length, straight, not hooked inwards. The stem and main branches are very generally clothed with short, densely and irregularly inserted, simple or rarely forked, subulate or fusiform ramuli, two or three lines in length, and tapering to both extremities, much more slender than the parts from which they spring, but otherwise of similar structure. *Articulations* coated with a stratum of minute, coloured cells, those of the lower part of the stem twice as long as broad, those of the upper about equalling their breadth; dissepiments opaque, constricted. *Fructification*; 1, *tetraspores* dark purple, several in the same joint, arranged transversely, immersed, very slightly prominent. 2, *favellæ* small, round, heaped together like clusters of grapes, irregularly placed on the sides of the lateral ramuli, destitute of involucre. These are commonly produced in great profusion; but I have occasionally observed solitary favellæ, furnished with an invo-

lucre, as represented at fig. 4. *Colour*, when in perfection, a purplish red but very frequently faded into various shades of brownish and greenish yellow. *Substance* cartilaginous and firm, rather rigid, adhering, but not strongly, to paper in drying.

By comparing the figure and specific character of this plant with those of *C. rubrum* (Plate CLXXXI.), it will be seen that *C. botryocarpum* is very closely allied indeed to that species: nor should I feel disposed, acting on my own judgment, to consider it as more than a curious state, or variety, with an anomalous fruit. Mrs. Griffiths is, however, of a different opinion, and so are Professor Kützinger and other botanists, to whom specimens have been submitted. To the decision of such competent observers I yield so far as to publish a figure, at the same time that I reserve my original opinion as one which I have not altogether laid aside.

C. botryocarpum is known from *C. rubrum* by its remarkable fruit, consisting of a great number of favellæ, without involucre, heaped together like bunches of grapes; in this respect it agrees with *C. Deslongchampsii*. I have, however, occasionally found solitary, involucrate favellæ, exactly similar to those of *C. rubrum*, on the same plants which produced clustered fruit on most of their branchlets. The colour is generally darker, and more purple than in *C. rubrum*, and the tips of the branchlets are straight. These are the principal characters on which it is proposed to establish the species.

C. botryocarpum was discovered by Miss Amelia E. Griffiths in 1844, in great plenty on Preston rocks, a short distance south of Torquay, and has been gathered every subsequent season in the same situations and in equal abundance. It is in perfection in June and July, and begins to decay about the middle of September.

Fig. 1. CERAMIIUM BOTRYOCARPUM;—*the natural size*. 2. Part of a branch, with fertile ramuli. 3. Ramulus with ordinary favellæ. 4. Ramulus with an involucrate favella. 5. Ramulus with tetraspores. 6. A tetraspore:—*all more or less magnified*.

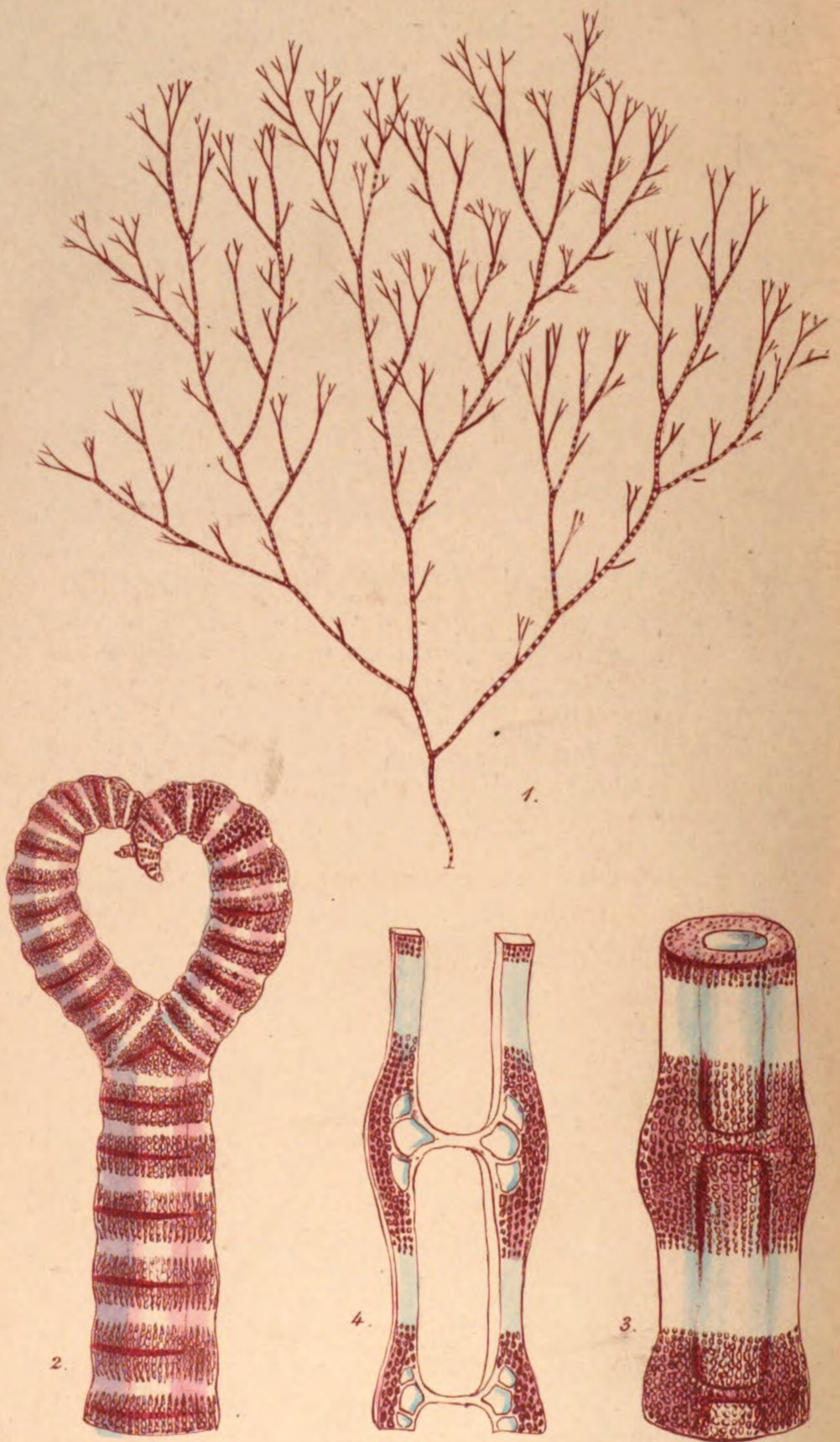


PLATE CCLXXVI.

CERAMIUM DECURRENS, *Kütz.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals: 1, *tetraspores* either immersed in the ramuli or more or less external; 2, sessile, roundish *receptacles* (*favellæ*) having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth*),—from *κεραμος*, a *pitcher*; but the fruit is *not* pitcher-shaped.

CERAMIUM *decurrens*; frond robust, gradually attenuated upwards, dichotomous, with few lateral branchlets, the apices hooked inwards; articulations partially coated with coloured cellules, which extend from the dissepiment at each end, but leave a colourless, pellucid space in the centre of the articulation; lowermost articulations twice as long as broad, upper very short.

CERAMIUM *decurrens*. *Harv. Man.* ed. 2. p. 162.

HORMOCERAS *decurrens* (β . *majus*), *Kütz. in Linn.* vol. xv. p. 733. *Kütz. Phyc. Gen.* p. 379. *Sp. Alg.* p. 675.

HAB. On the smaller Algæ in tide-pools. Rare? Annual. August. On the Harbrich, at Torquay, *Mrs. Griffiths* (1844).

GEOGR. DISTR. Mediterranean Sea.

DESCR. *Frond* (in British specimens) six to eight inches long, as thick as hog's bristle below, gradually attenuated upwards, and capillary above, repeatedly and pretty regularly dichotomous, but scarcely fastigate; the lower divisions of the frond distant, the upper more and more approximating. A few simple or forked short ramuli are scattered here and there along the branches. *Articulations* in the lower part of the frond about twice as long as broad, their upper and lower parts covered with coloured cellules, disposed in longitudinal lines; their middle colourless and bare. In the upper divisions of the frond and in the ramuli the articulations are very short, coated with cells except a narrow central pellucid band. The apices are strongly hooked inwards. I have not seen any fructification. *Colour* a full red, something like the colour of brick-dust, with a slightly purplish hue. *Substance* membranaceous, not very closely adhering to paper.

The original *C. decurrens* of Kützing is described as being "minute, scarcely an inch long, and capillary:"—the plant here figured is considered by that author, to whom I transmitted a specimen, to be a larger variety of the species, agreeing in all

characters except in size with his specimens. I trust, therefore, that in adopting the specific name I am not committing an error, although, were I to form my judgment of *C. decurrens* on the diagnosis assigned to it by its founder, I should not have referred to it the specimens here figured.

Our *C. decurrens* seems to be almost exactly intermediate between *C. rubrum* and *C. diaphanum*. It agrees with the former in size, but differs in having a translucent space, destitute of coloured cells, in the middle of each internode. From *C. diaphanum* it differs chiefly in having the lines of coloured cells which clothe the nodes continued over a considerable space of the articulation, and thus, as it were, *decurrent* along the stem. The exact disposition of these cells, and the structure of the stem, is well seen when a longitudinal slice is taken, as at fig. 4. The minute coloured cells will then be found immersed in the transparent walls of the frond.

I have seen no other specimens than those found at Torquay, one of which is here figured. There is a variety of *C. rubrum* which I once confounded with *C. decurrens*, from its having a pale or transparent band in the centre of the internode;—but this variety, when examined more closely, will be found to have the whole of its walls traversed by strings of cells, but having those of the centre part colourless or pale.

Fig. 1. CERAMIUM DECURRENS, β . *majus*:—the natural size. 2. Apex of a branch. 3. Articulations from the middle of a branch. 4. Vertical section of the same:—all highly magnified.



PLATE CCXIX.

CERAMIUM DESLONGCHAMPII, *Chauv.*

GEN. CHAR. *Fronde* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucrel ramuli. CERAMIUM (*Roth.*), —from *κεραμος*, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *Deslongchampii*; filaments subsetaceous, attenuated upwards, rigid, irregularly dichotomous, with or without lateral ramuli; the apices straight, spreading; articulations colourless, those of the main stems about thrice as long as broad, of the branches and ramuli much shorter; dissepiments opaque, scarcely swollen; tetraspores whorled round the joints, prominent; favellæ (?) heaped together, bursting irregularly from the sides of the branches, destitute of involucrel ramuli.

CERAMIUM *Deslongchampii*, *Chauvin, Alg. Norm. J. Ag. Advers.* p. 26.
Wyatt, Alg. Danm. no. 218. *Hook. et Harv. in Lond. Journ.* vol. vi. p. 410.

CERAMIUM *Agardhianum*, *Griff. in Harv. Man.* p. 99.

GONGROCERAS *Deslongchampii*, *Kütz. in Linn.* 15. p. 735. *Phyc. Gen.* p. 379. t. 46. f. 1.

HAB. On rocks and stones between tide-marks, and on the smaller Algæ. Annual. Spring and summer. Generally distributed round the British coasts. Torquay, *Mrs. Griffiths*. Swansea, *Mr. Ralfs*. Mine Head, Somerset, *Miss Gifford*. Ardrossan, *Rev. D. Landsborough*. Frith of Forth, *Dr. Greville*. Belfast Bay, *Mr. Templeton*. Dublin Bay, *Miss Ball*. Very abundant at Balbriggan, &c., *W.H.H.*

GEOGR. DISTR. Coast of France. Heligoland, *Binder*! Tasmania, *Gunn*.

DESCR. *Root* discoid, occasionally giving off short fibres. *Fronde* densely tufted, from two to four or five inches long, rather thicker than human hair, rigid and with a rough feel, slightly attenuated upwards, branched in a more or less regularly dichotomous order, the angles not very patent. *Branches* much divided, either naked throughout, or giving off, in greater or less abundance, short, simple, or forked, lateral ramuli. These ramuli are distributed in a very irregular manner; sometimes alternate, more frequently secund, and often very densely crowded, especially in the upper portion of the frond, which then becomes very bushy. Sometimes, as represented in fig. 2, the frond is very much distorted; the branches spreading at right angles, and the ramuli variously curved and twisted. *Apices* of the branches straight and spreading, subulate. *Articulations* pellucid, those of the lower part of the stem about thrice as long as broad, of the branches about equalling

their breadth, and of the ramuli gradually shorter; *dissepiments* dark-coloured, cylindrical, or slightly swollen. *Tetraspores* several in each joint, whorled, large, and very prominent. *Favellæ* (?) imperfectly organized, very irregular in form, issuing in dense clusters from the sides of the branches, heaped together, destitute of involucre, containing a fine dark-coloured powder, but no regularly formed *spores*. These *favellæ* (?) are produced by the same individuals that contain tetraspores. *Substance* rigid, not closely adhering to paper, unless after long steeping in fresh water. *Colour*, a dark brownish purple or blackish red.

A more slender plant than *C. diaphanum*, of a darker colour, and with shorter joints, and further distinguished from that species by the straight tips of the branches, more prominent tetraspores, and above all, by the clustered *favellæ*, bursting in irregular masses from various parts of the stem and branches. I confess that I cannot regard these clusters as a normal fructification, nor am I confident that they are even imperfectly formed *favellæ*, but rather consider them as erumpent masses of cells, of an anomalous character. From true *favellæ* they differ in being destitute of involucreal ramuli, and also in their structure, the contents being a fine powder compacted together, without trace of *spores*, such as are usually found in these organs.

A distorted variety (fig. 2) frequently occurs among normal specimens, and this is very generally furnished with the anomalous fruit. Some specimens are excessively squarrose, with the stem and branches regularly bent at short distances, and every ramulus divaricating.

Our figure has been printed in too red an ink.

Fig. 1. Tuft of CERAMIMUM DESLONGCHAMPII. 2. A distorted frond:—*both of the natural size*. 3. Portion of the main stem. 4. Apex of a branch, with imbedded tetraspores. 5. Fertile joints from the same, with tetraspores *in situ*. 6. Apex of a branch, with erumpent *favellæ* (?). 7. Joints from the same, with *favellæ* (?) and *tetraspores*:—*all more or less magnified*.

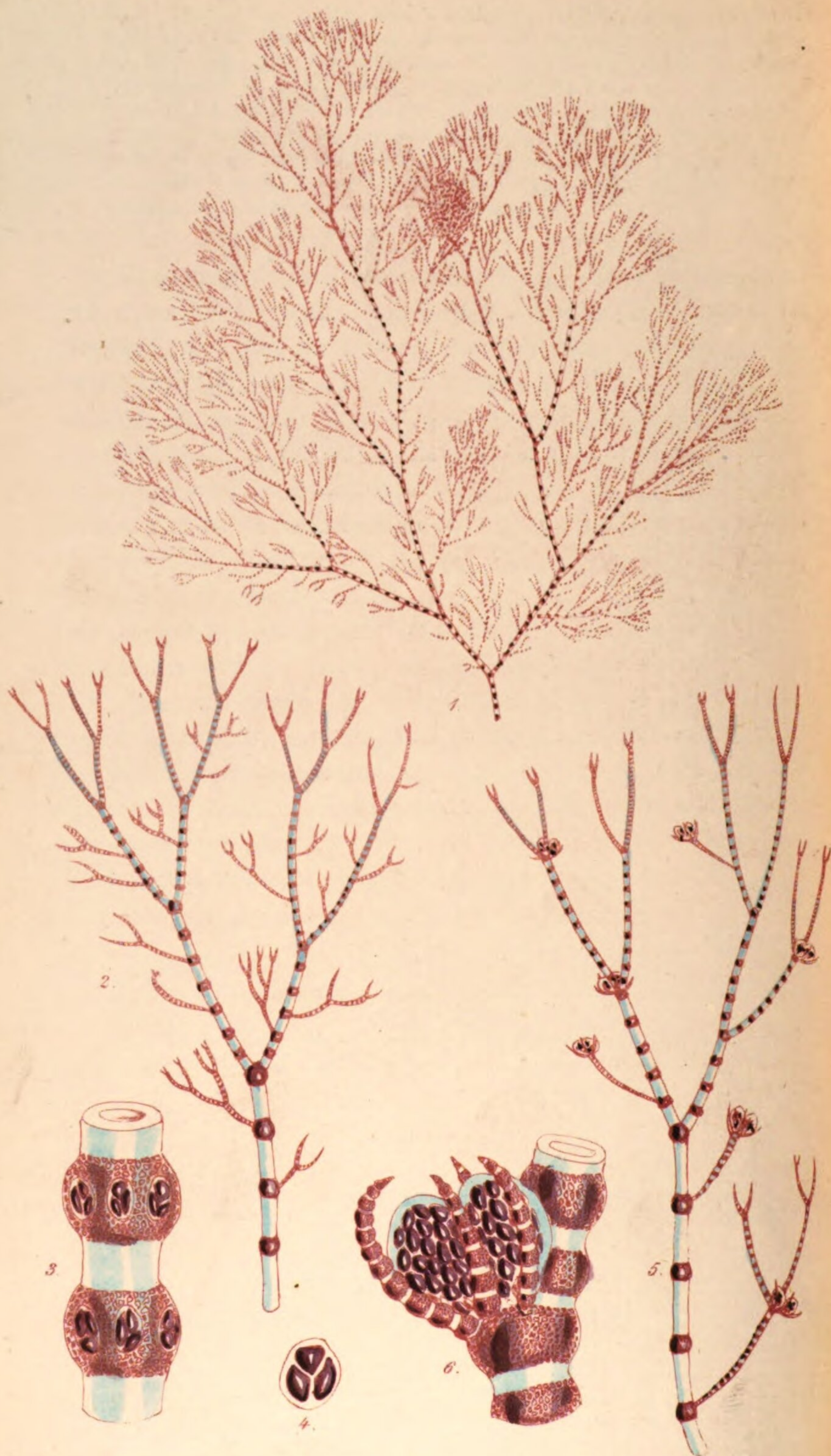


PLATE CXCIIL.

CERAMIUM DIAPHANUM, Roth.

GEN. CHAR. *Fronde* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds on distinct individuals; 1, *tetraspores* either immersed in the ramuli or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more, short, involucral ramuli. CERAMIUM (Roth.),—from *κεραμος*, a *pitcher*; but the fruit is not pitcher-shaped.

CERAMIUM *diaphanum*; filaments setaceous, attenuated upwards, rather flaccid, irregularly dichotomous, the lower forkings distant, the upper close together; branches set with short, lateral, dichotomous ramuli; articulations colourless, those of the main stems three or four times as long as broad, of the ramuli short; dissepiments swollen, opaque; apices hooked inwards; tetraspores whorled in the joints, depressed; favellæ in the ultimate forkings of the branches, or on lateral ramuli, involucrate.

CERAMIUM *diaphanum*, Roth, *Cat. Bot.* vol. iii. p. 154. *Ag. Syn.* p. 61. *Hook. Fl. Scot.* part 2. p. 85. *Ag. Syst.* p. 133. *Ag. Sp. Alg.* vol. ii. p. 150. *Grev. Fl. Edin.* p. 310. *Harv. in Hook. Br. Fl.* vol. ii. p. 336. *Wyatt, Alg. Danm.* no. 87. *Harv. in Mack. Fl. Hib.* part 3. p. 210. *Harv. Man.* p. 99. *J. Ag. Alg. Medit.* p. 81. *Endl. 3rd Suppl.* p. 27.

HORMOCERAS *diaphanum*. *Kg. Phyc. Gen.* p. 378. *Kg. Linn.* xv. p. 733.

CONFERVA *diaphana*, *Lightf. Fl. Scot.* p. 996. *Fl. Dan.* t. 951. *Roth. Fl. Germ.* p. 525, and *Cat.* vol. ii. p. 226. *Dillw. Conf.* t. 38. *E. Bot.* t. 1742. *With.* vol. iv. p. 139.

CONFERVA *nodulosa*, *Huds. Fl. Ang.* p. 600.

BORYNA *diaphana*, *Grat. Dict. Class.* t. 11. *Bory, Morée.* p. 77. no. 1797.

HAB. Parasitical on several of the smaller Algæ in rock-basins, between tide marks; sometimes growing on rocks. Annual. Summer. Not uncommon on the British coasts from Orkney to Cornwall.

GEOGR. DISTR. Dispersed throughout the temperate parts of the Atlantic and Pacific Oceans. (The various localities given require re-examination, as several species are commonly confounded by authors under the name *diaphanum*.) Mediterranean and Black Seas, *Ag.*

DESCR. *Root* minute, discoid. *Fronde*s, three to six or eight inches long, not very densely tufted, setaceous at base, gradually attenuated upwards to a capillary fineness, more or less regularly dichotomous, or flabellately branched, sometimes alternately divided with an evident main-stem; the branches naked, or set with slender, forked, or several times dichotomous, short ramuli, one to three lines in length. Apices hooked in. Lower axils distant, spreading; upper gradually closer and more erect. *Articulations*

pellucid, those of the main branches four or five times longer than broad; of the upper branches gradually shorter; of the ramuli exceedingly short; all deeply coloured at the swollen joints. *Tetraspores* immersed in the joint, several in each, disposed in a whorl. *Favellæ* surrounded by an involucre of several (4-5) short incurved ramuli, either sessile in the upper forks or borne on lateral peduncles. *Substance* soft, but rather firm; glossy when dry, and adhering pretty firmly to paper. *Colour*, a brownish-red, with a purplish tinge; sometimes more clearly purple.

Our figure is intended to represent the *typical* form of the old *Conferva diaphana* of British authors, the longest known of the extensive group of the genus to which it belongs; a group which contains numerous very distinct plants, which were once confounded together as varieties of the species now under review. From the British species of this section, except one, our *C. diaphanum* may be at once known by its larger size and more robust filaments; it is also well characterized by the lateral dichotomous ramuli given off all along the principal divisions of the frond, and by the gradually attenuated filaments. These last characters distinguish it from *C. nodosum* and *C. fastigiatum*.

Limited as it now is, the species has a very wide range, being found in most of the temperate parts of the sea. Though existing on all our coasts, from north to south, it does not appear to be very abundant anywhere, seldom growing in society: the tufts being thinly scattered here and there through the rock-pools. When growing, few Algæ are more delicately beautiful; and even in a dry state it forms a very handsome object, the brilliancy and regularity of the dot-like joints, connected by hyaline, glistening spaces, having the effect of a piece of fine tracery.

Fig. 1. CERAMIUM DIAPHANUM:—*of the natural size.* 2. Branch, with tetraspores. 3. Joints from the same. 4. A tetraspore. 5. Branch with favellæ. 6. Joints from the same, with involucreted favellæ:—*all more or less highly magnified.*



PLATE CCVI.

CERAMIUM GRACILLIMUM, *Griff. et Harv.*

GEN. CHAR. *Fronde* filiform, one tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores* either immersed in the ramuli or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more, short, involucrel ramuli. CERAMIUM (*Roth.*),—from *κεραμος*, a *pitcher*; but the fruit is not pitcher shaped.

CERAMIUM *gracillimum*; frond excessively slender, of nearly equal diameter throughout, very flaccid and gelatinous, dichotomous; the branches set with minute, flabelliform, dichotomous ramuli; articulations colourless, those of the branches five or six times as long as broad, those of the ramuli very short; dissepiments opake, purple; favellæ borne on the lateral ramuli, with a spreading, many-rayed involucre.

CERAMIUM *flaccidum*, *Harv. in Herb.*

HORMOCERAS *gracillimum*, *Kütz. in Linn. vol. xv. p. 733. Kütz. Phyc. Gen. p. 378.*

HAB. On muscle shells and on *Corallina officinalis* and other small Algæ, exposed at extreme low-water. Annual. September. Kilkee, coast of Clare, *W.H.H.* (1844). Mewstone, Plymouth, *Rev. W. S. Hore* and *Dr. Cocks*. Penzance, *Mr. Ralfs*. Probably common.

GEOR. DISTR. Mediterranean Sea. Atlantic coast of France.

DESCR. *Fronde*s densely tufted, two or three inches long, much more slender than a human hair, exceedingly flaccid and tender, irregularly dichotomous or somewhat alternately divided; the principal stem and branches of nearly equal diameter from their base to the extremity, the forkings distant. *Branches* furnished at intervals of one or two joints with minute, alternate, dichotomous, flabelliform ramuli, a line or two in length, obovate in outline and level topped. *Apices* incurved, but not strongly hooked. *Articulations* colourless; those of the lower part of the stem many times longer than broad, of the branches gradually shorter; and in the lateral dichotomous ramuli much shorter than their breadth, the terminal ones appearing like mere striæ. *Dissepiments* opake, purple, swollen. *Favellæ* either on lateral ramuli, or on truncated branches, binate, globose, surrounded by elongated, forked involucrel ramuli. *Tetraspores*, I have not seen. *Substance* exceedingly tender and gelatinous, closely adhering to paper in drying. *Colour*, a dark, reddish purple.

I first met with this plant in the autumn of 1844, at Kilkee,

on the west coast of Ireland. It covered a very large surface of rock, growing almost to the exclusion of every other species, both in places left bare at low water, and in the small tide-pools. In both situations it seemed to prefer the stunted fronds of *Corallina officinalis* for its habitat. It has a softer and more gelatinous substance than any British *Ceramium*, and this character, with its extreme tenuity, and the minute, fastigate lateral branchlets, readily distinguish it from any of the section of the genus to which it belongs.

On communicating specimens to Professor Kützing, he informed me that they were identical with his *Hormoceras gracillimum* described four years previously. There can therefore be no confusion of synonyms in our adopting the species of the German author, whose specimens came from the Adriatic.

C. gracillimum is the smallest and most slender of our British *Ceramia*. So slender are its threads, so flaccid, and so densely crowded together, that it is almost impossible to display them properly on paper. They almost invariably become entangled together, and once this has occurred, it is in vain to attempt their disentanglement.

Fig. 1. Tuft of CERAMIUM GRACILLIMUM, growing on Corallina officinalis; the natural size. 2. A branch. 3. A ramulus. 4. Pedunculated Favella with its involucre;—all more or less highly magnified.

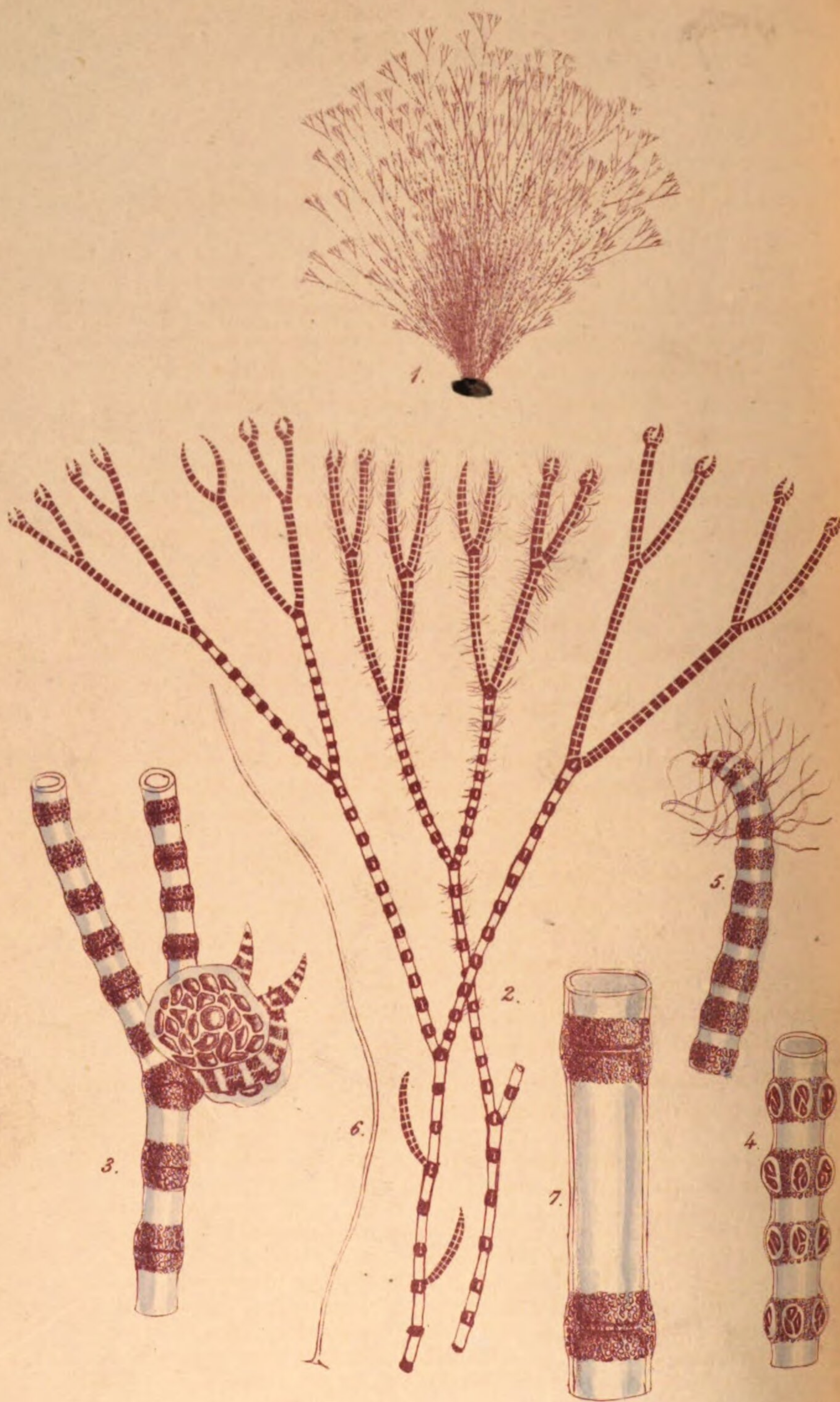


PLATE CCCXXXIV.

CERAMIUM STRICTUM, *Kütz.* (sp.)

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals: 1, *tetraspores*, either immersed in the ramuli, or more or less protrudent; 2, sessile, roundish *receptacles* (*favellæ*) having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth*),—from *κεραμος*, a *pitcher*; but the fruit is *not* pitcher-shaped.

CERAMIUM *strictum*; frond capillary, nearly equal, membranaceous, irregularly dichotomous, the lower forkings distant, the upper closer, all the divisions erect and straight, with narrow, acute axils; the apices straight or slightly hooked inwards; articulations colourless, those of the lower dichotomies from three to four times as long as broad, of the upper gradually shorter; dissepiments (smooth or hairy) opaque, purple; *favellæ* near the tips of the branches, involucrate; tetraspores erumpent, bursting from the dissepiments of the larger branches, quadrifarious.

CERAMIUM *strictum*, *Harv. Man.* ed. 2. p. 164.

GONGROCERAS *strictum*, *Kütz. in Linnæa*, 1842, p. 735. *Phyc. Gen.* p. 380. *Sp. Alg.* p. 678.

HAB. On mussel-shells, corallines, &c.; in tide-pools, near low-water mark. Torquay, *Mrs. Griffiths*. Penzance, *Mr. Ralfs*. Plymouth, *Mr. Boswarva and Dr. Cocks*. Jersey, *Miss Turner*. Dingle, Kerry, *W. H. H.* Roundstone, *Mr. M'Calla*.

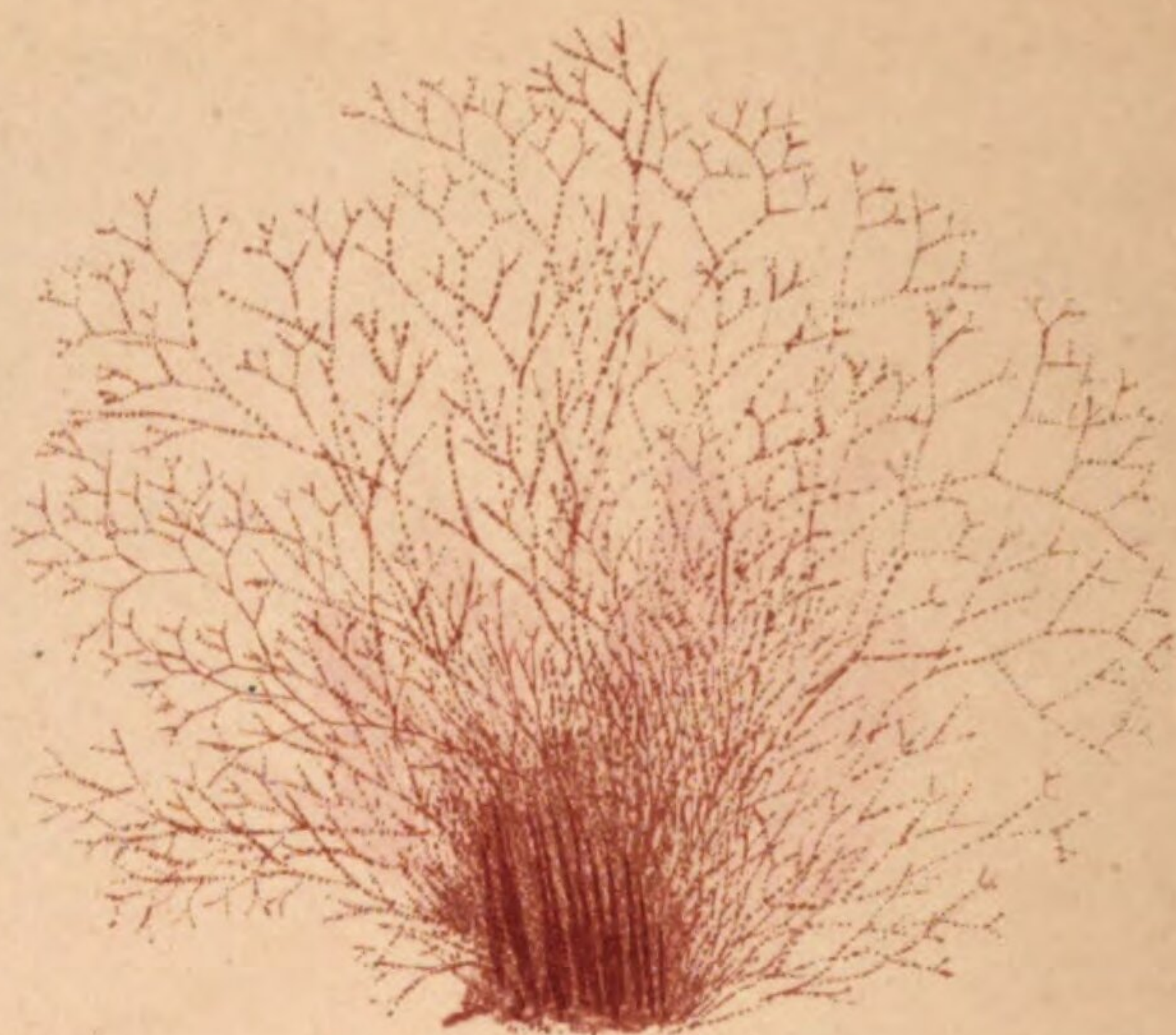
GEOGR. DISTR. German Ocean, *Kütz.*

DESCR. *Filaments* capillary, from two to four inches high, densely tufted, the bases of the tufts entangled, from the presence of irregular creeping fibres. *Filaments* of nearly equal diameter throughout, dichotomous, without principal stem, but sometimes furnished with a few lateral ramuli; the lower dichotomies distant, the upper closer; all the segments of the filament straight and erect, the axils acute and narrow; the apices more or less fastigate, generally sharply bifid, with the points incurved, but not strongly involute. *Articulations* of the middle and lower portions three to four times, of the upper twice as long as broad, and of the ultimate and penultimate forkings much shorter than their breadth. *Dissepiments* coated with dense, minute, purple cells, slightly swollen, either quite smooth, or (when young) clothed with copious, long, slender, flexible hairs. *Favellæ*

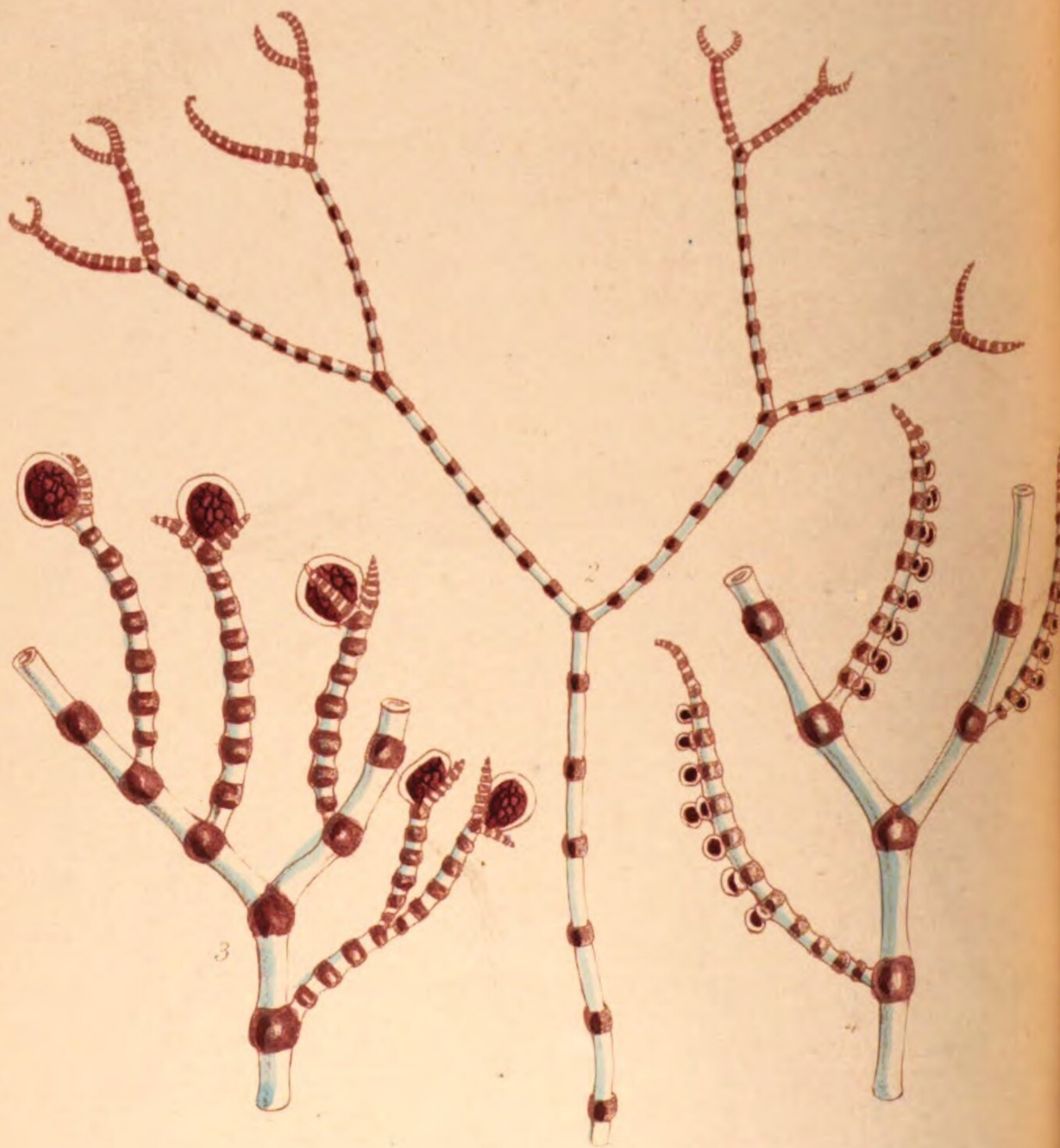
often situated in a forking of the branch, and generally in one of the uppermost forks, subtended by a few short ramuli. *Tetraspores* prominent, forming a whorl round the joint, in the upper (but not ultimate) divisions of the filament. *Colour* a dark purplish-red. *Substance* delicately membranaceous and soft. In drying the plant closely adheres to paper, and has a peculiar glassy lustre, especially in the colourless portions of the thread.

A beautiful species, and a *tolerably* definite one, considering the genus to which it belongs! It is known from *C. nodosum* by its less patent branching, its more purple colour, and different disposition of the tetraspores, besides minor characters, more readily taken in by the eye than the ear. Sometimes the branches are found quite smooth, and at other times every node of the upper branches and ramuli is densely clothed with long, flexible hairs, which appear to be the same pubescence that Kützinger describes, and on the presence of which he founds his genus *Trichoceras*. At first, on noticing these hairs, abundantly clothing a specimen sent by Miss Turner from Jersey, I was disposed to regard them as a specific character, and to suspect that I had before me *Trichoceras villosum* of Kützinger. Whether this be so or not, I soon abandoned all thoughts of grounding a species on the presence or absence of such hairs, for I found, on examining numerous splendid specimens sent to me by Mr. Boswarva and Dr. Cocks, that nothing could be more inconstant; branches from the same tuft differing in the degree of hairiness, and specimens from the same locality, and identical in all other characters, being some hairy, some perfectly smooth. Lastly, on re-examining my original Dingle specimens, which had been acknowledged by Kützinger himself to be truly his *C. strictum*, I found traces of similar pubescence. And such hairs are by no means restricted to this species, but occur on *C. rubrum*, and probably on most other species. They are, I suspect, organs of the same nature as the *fibrillæ* of *Polysiphoniæ*, and if this be the case we may expect to find *antheridia* on them.

Fig. 1. CERAMIMUM STRICTUM:—*the natural size*. 2. Portions of two filaments, one hairy, the other smooth. 3. Part of a branch, with a *favella*. 4. Part of a branch, with *tetraspores* in situ. 5. Apex of a branch, partially clothed with hairs. 6. A hair. 7. An articulation of the lower part of the filament:—all the latter figures *more or less highly magnified*.



1



3

PLATE XC.

CERAMIUM NODOSUM, *Griff. and Harv.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification*, of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth*),—from *κέραμος*, a *pitcher*, but the fruit is *not* pitcher-shaped.

CERAMIUM *nodosum*; frond capillary, of equal diameter throughout, rigid, dichotomous, excessively divided, fastigate; the axils very patent; articulations pellucid, those of the middle of the stem from four to six times as long as broad, the upper gradually shorter; dissepiments swollen; tetraspores erumpent, two or three together on the outer edge of short, accessory ramuli; favellæ at the apex of accessory ramuli.

HORMOCERAS *nodosum*, *Kütz. in Linnæa*, vol. xv (1841). p. 732. *Kütz. Phyc. Gen.* p. 378. t. 45. f. 1–7 (showing the germination of a spore).

CERAMIUM *diaphanum*, rigid variety, *Wyatt, Alg. Danm.* no. 217.

CERAMIUM *rigidulum*, *Griff. and Harv. in Herb.*

CERAMIUM, new species, *Mc'Calla, Alg. Hib.* vol. i. no. 43.

HAB. On sandy shores, often at the roots of *Zostera*. Meadfoot, near Torquay, *Mrs. Griffiths*. Isle of Wight, *Miss Kirkpatrick*. Dublin Bay and Ireland's Eye (1838), *Miss Ball*. Bangor (1835) and Newcastle, Co. Down, *Mr. W. Thompson*. Howth, *Miss Gower*. Rathmullar, *Mrs. Ovens*. Roundstone Bay, *Mr. Mc'Calla*.

GEOGR. DISTR. Mediterranean Sea, *Kützing*. New York, *Professor Bailey*. Tasmania, *Ronald Gunn, Esq.*

DESCR. *Fronds* springing many from the same base, and forming dense globular tufts, from three to six inches in diameter. *Filaments* very slender, finer than human hair, excessively branched from the base in a more or less regularly dichotomous manner, preserving an equal diameter throughout their length; more or less furnished in the upper part, especially in fertile specimens, with short ramuli. *Axils* in all parts of the frond, very patent, sometimes divaricating. *Apices* nooked inwards. *Articulations* colourless, five or six times as long as broad in the lower and middle branches, thrice as long as broad in the upper; and gradually diminishing in length towards the apex. *Dissepiments* smooth (without prickles), globose, swollen, coated with a stratum of minute brownish-red cellules. *Tetraspores* formed in the dissepiments of short, lateral ramuli, roundish, with a wide border. *Colour* of the tufts, brownish-red. *Substance* rigid and harsh to the touch when recent; soon becoming flaccid. It adheres, but not very strongly, to paper in drying.

The species of the genus *Ceramium*, unless, with earlier writers, we reduce the multiplied forms presented to the eye to three or four *types*, are not only very numerous, and very widely dispersed, but are so closely connected together by doubtful looking varieties, that their study and disentanglement becomes a task of much difficulty. Until of late years British authors have been contented to recognise but three, *C. rubrum*, *C. diaphanum* and *C. ciliatum*; to which, in the 'Manual', I ventured to add two others. But now, since Kützing has published, though with less perfect materials to work upon than exist in British Herbaria, no less than forty-two which he divides into six genera (!); the attention of British botanists has been aroused, and many new *Ceramia* added to our list.

Among these is the subject of the present plate, which having been published in two collections of dried specimens, is pretty generally known to British botanists, though perhaps not under the name here given. I believe it was first detected by Mrs. Griffiths, from whom I received specimens several years ago, and by her has always been regarded as a well marked species, distinguished from those most nearly allied to it, by a certain harshness to the touch, or rigidity, as well as by its very patent forking. In these respects it differs from *C. fastigiatum*, which it most nearly resembles.

Of the synonyme of Kützing, I feel confident, having submitted a specimen to that author; but by him *C. nodosum* is placed in his genus *Hormoceras*, the character of which is to have immersed tetraspores, whereas, I find these to be erumpent, a character which would place it in *Gongroceras*, Kütz. Possibly Kützing's specimens had not mature fruit.

Occasionally, tufted, root-like fibres issue from the swollen joints, as I find on Miss Ball's and Miss Gower's specimens.

Fig. 1. CERAMIUM NODOSUM:—of the natural size. 2. Upper portion of a filament. 3. Portion of a fertile frond, with *favellæ*. 4. Portion of a fertile frond with *tetraspores*:—all more or less highly magnified.

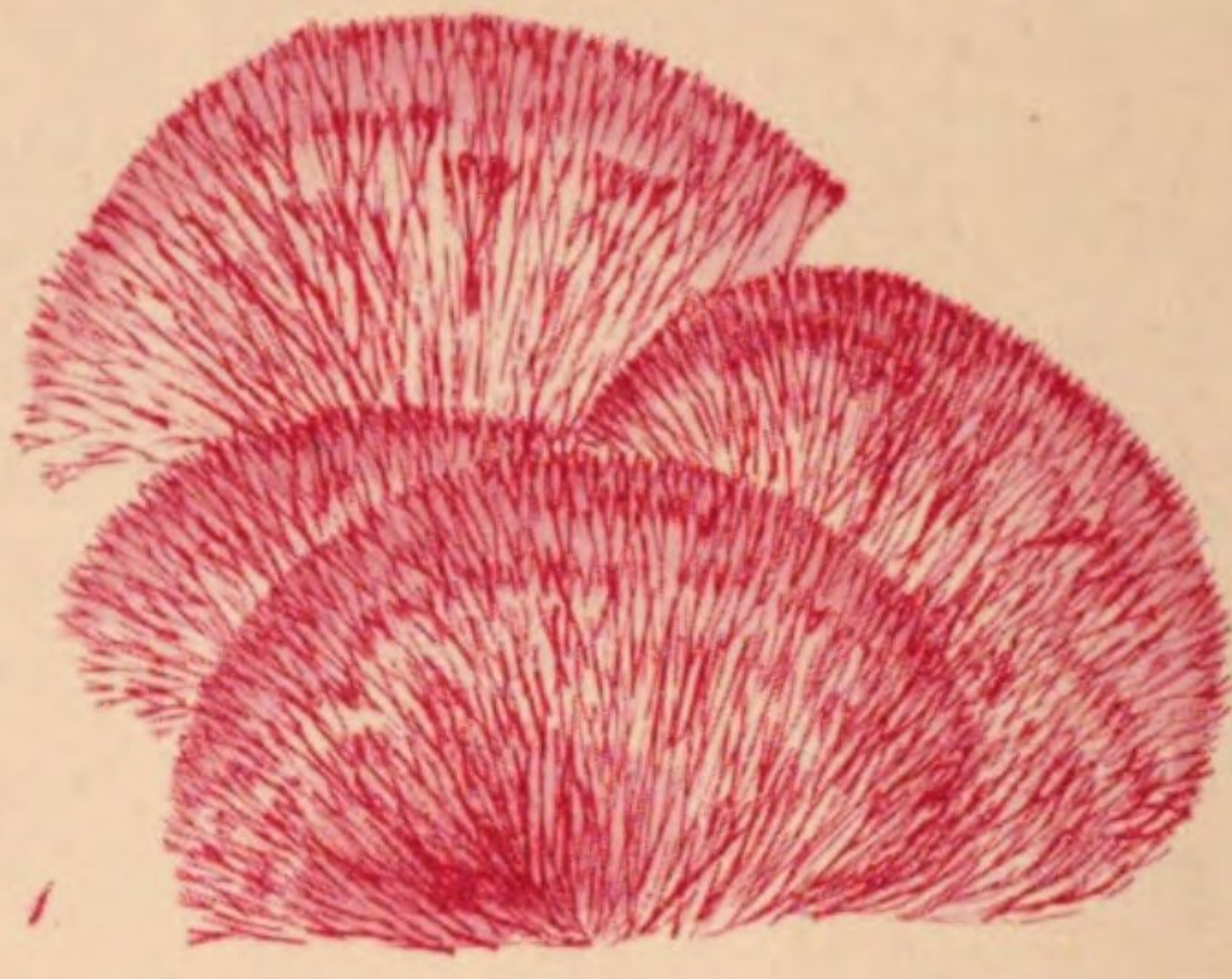


PLATE CCLV.

CERAMIUM FASTIGIATUM, *Harv.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds on distinct individuals; 1, *tetraspores* either immersed in the ramuli or more or less external; 2, sessile, roundish *receptacles* (*favellæ*) having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth*),—from *κεραμος*, a *pitcher*; but the fruit is *not* pitcher-shaped.

CERAMIUM *fastigiatum*; frond capillary, of equal diameter throughout, flaccid, dichotomous, level-topped; the axils acute; articulations pellucid, those of the middle of the stem from four to six times longer than broad, the upper gradually shorter, and coloured; dissepiments coated with coloured cells; favellæ small, subterminal, subtended by three or four involucral ramuli.

CERAMIUM *fastigiatum*, *Harv. in Hook. Lond. Journ. Bot.* vol. i. p. 303. *Wyatt, Alg. Danm.* no. 86. *Harv. Man.* 1st ed. p. 99.

GONGROCERAS *fastigiatum*, *Kg. in Linn.* xv. p. 736. *Phyc. Gen.*

HAB. On rocks, &c., near low-water mark; rare. Annual. Autumn and winter. Torquay, *Mrs. Griffiths*. Mt. Batten, Plymouth, *Rev. W. S. Hore*. Frith of Forth, *Dr. Greville*.

GEOGR. DISTR. Mediterranean Sea, *Kützing*. East coast of North America.

DESCR. *Filaments* 4–5 inches high, as thick as human hair, densely tufted, of equal diameter throughout, fastigiate, many times dichotomous, regularly forking from the base to the apex, mostly bare of lateral branchlets, but sometimes having a few, short, simple or forked ramuli. The lower axils distant, and somewhat spreading; the upper close together and narrow, acute. *Apices* generally emarginate, the points straight, or slightly curved, somewhat hooked, but not rolled inwards. Lower *articulations* from three to six times as long as broad, pellucid and colourless, furnished occasionally with a few scattered granules; upper articulations gradually shorter, the pellucid spaces suffused with pale, watery endochrome; the uppermost very short and strongly coloured. *Favellæ* of small size, sessile near the apex of the frond, having a few short, involucral ramuli. *Tetraspores* I have not seen. *Substance* tender, and flaccid, closely adhering to paper. *Colour*, in the tuft, a dark purple, fading in the herbarium to brick-dust colour; in the filament, a clear purplish lake.

This is one of the rarest and most beautiful of the British species of *Ceramium*. It is nearly related to *C. nodosum*, particularly in ramification, and in the diameter of its filaments; but

the substance is much more soft and tender than in that species, and the colour much brighter. The upper joints, moreover, in the present species are suffused with a beautiful carmine, and the axils are far less patent. The tufts are perfectly fastigate, forming regular circular fans when displayed on paper.

The merit of having first correctly distinguished the present plant is due to Mrs. Griffiths, who has for many years studied the species of the puzzling genus *Ceramium* with great care, and who is, therefore, more competent than most botanists to judge of the proper limits of the species. Whether this plant be the *Conferva fastigiata* of Roth (Cat. Bot., vol. ii. p. 224), I am unable to decide, having never seen an authentic specimen of that author's naming, but I suspect that half-a-dozen *Ceramia* which are now regarded as species, have been at different times referred to Roth's synonym. Our present plant is by no means confined to one locality. The specimens from the several stations above noted, are all of the same character, and I have also had the pleasure of receiving from my liberal correspondents, Professor Bailey of New York, and Mr. Olney of Rhode Island, U.S., North American specimens in all respects similar to our British ones.

Fig. 1. Tuft of CERAMIUM FASTIGIATUM:—*of the natural size*. 2. Portion of a filament:—*magnified*. 3. Apex of the same, with favella. 4. Articulation from the lower part of the same:—*both highly magnified*.

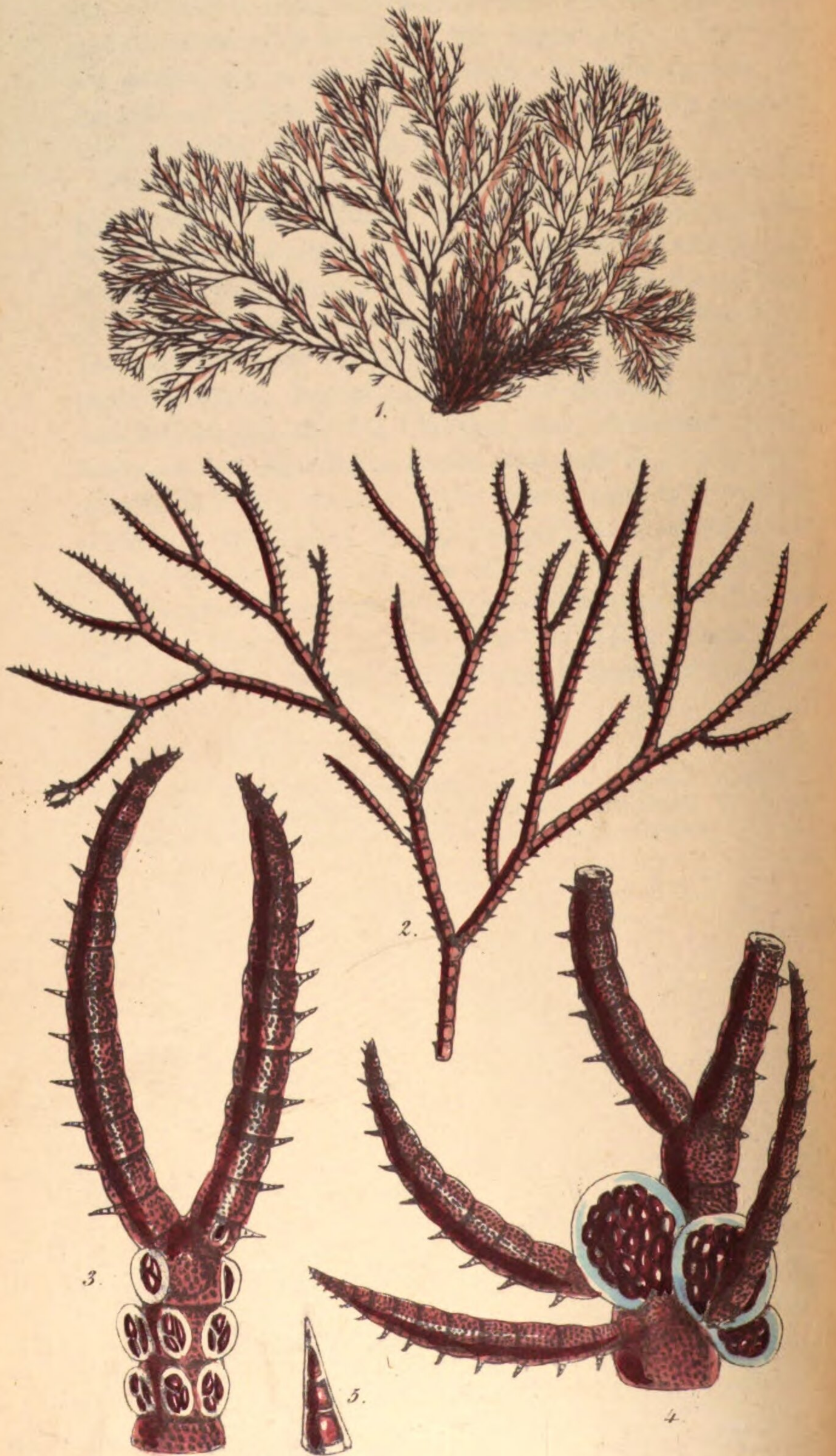


PLATE CXLIV.

CERAMIUM FLABELLIGERUM, *J. Ag.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli.—CERAMIUM (*Roth*), from *κεραμος*, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *flabelligerum*; frond subsetaceous, attenuated upwards, rigid, flabellately branched, irregularly dichotomous, with lateral forked ramuli, the apices acute, patent or somewhat incurved; articulations coated with coloured cellules, those of the lower branches about twice as long as broad, of the upper equal in length and breadth, each armed on the outer edge with a single, minute, subulate, coloured, three-jointed prickle; tetraspores erumpent, whorled round the joint; favellæ two- or three-lobed, berry-like, subtended by several patent, subulate ramuli.

CERAMIUM *flabelligerum*, *J. Ag. Advers.* 27.

HAB. Parasitical on the smaller Algæ between tide marks. Annual. Summer and Autumn. Rare. Torbay, *Mrs. Griffiths*. Jersey, *Miss. H. M. White*.

GEOGR. DISTR. South of England. Coast of Spain; at Cadiz, *Cabrera*.

DESCR. *Fronds* more or less densely tufted, but not matted together, from two to three inches high, nearly as thick as hogs' bristle below, becoming gradually more slender upwards, and towards the apex as fine as human hair, divided in an irregularly dichotomous manner, distichous, the main divisions having a more or less fan-shaped outline, but not strictly fastigate, repeatedly forked; the upper branches furnished with more or less numerous, minute, simple or forked, lateral ramuli from one to two lines in length, erecto-patent, somewhat constricted at base, acute and attenuate at the point. *Axils* patent in all parts of the frond. *Apices* generally spreading, sometimes slightly incurved, but never hooked inwards. *Articulations* tolerably uniform, those of the lower part of the stem from once and a half to twice as long as broad, of the upper branches and ramuli about equal in length and breadth, all coated with a stratum of minute, coloured cells, opaque, slightly contracted at the dissepiment and there furnished on the outer margin with a single, minute, horizontally patent, subulate, three-jointed prickle. *Tetraspores* large, tri-partite, with wide pericarps, erumpent, whorled round the joints. *Favellæ* dispersed along the sides of the upper branches, consisting of two or more rounded, berry-like lobes, with

wide pericarps, containing numerous large granules; the cluster surrounded by several, longish, patent, spindle-form, involucral ramuli. *Colour* a dull red. *Substance* somewhat cartilaginous, not closely adhering to paper.

The external habit of this species is so different from that of the other ciliated *Ceramia* that it can scarcely be confounded with any of them. It bears a much closer resemblance to a small specimen of *C. rubrum*, to which species there is much similarity both in the branching and in the length and structure of the joints; but from which it may be at once distinguished under the microscope by the minute prickle with which each of the joints is armed at its outer edge. I believe that it was first discriminated by Mrs. Griffiths, who communicated specimens to Professor J. Agardh, from whom it received the name here adopted. It is by no means common, nor have I seen any British specimens except those collected by Mrs. Griffiths, and some for which I am indebted to Miss White, who gathered them in Jersey. Professor Agardh has obligingly sent me a specimen from the coast of Spain, which has all the essential characters of the British plant. Perhaps the most nearly allied species to *C. flabelligerum* is *C. monile*, a native of Tasmania, whose joints are armed with similar prickles, but the general branching of the frond and its size are very different.

Fig. 1. CERAMIUM FLABELLIGERUM:—*the natural size*. 2. Part of the filament. 3. Apex of a filament, bearing *tetraspores*. 4. Portion of a filament, with *favellæ* and involucral ramuli. 5. A prickle.

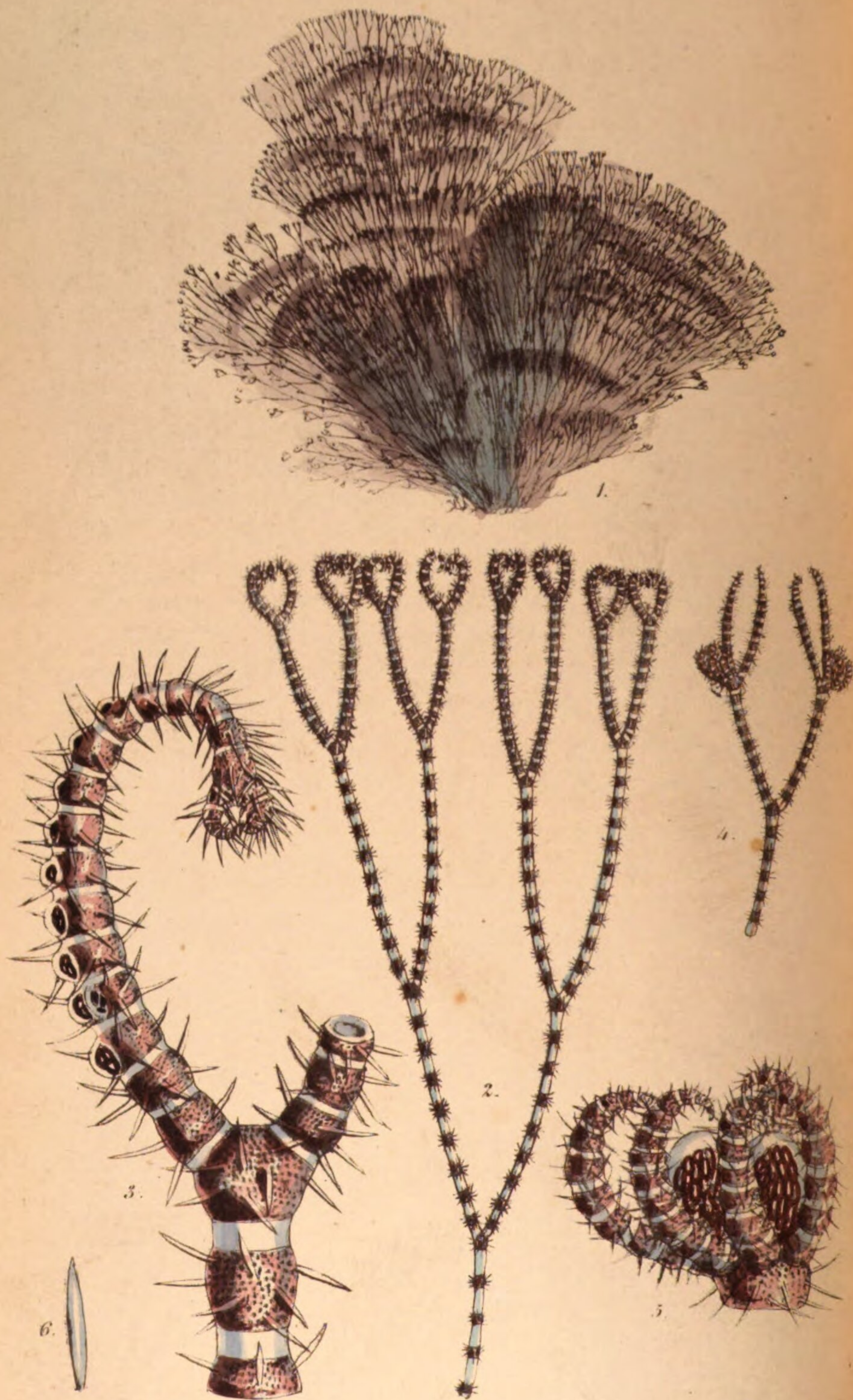


PLATE CXLI.

CERAMIUM ECHIONOTUM, *J. Ag.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucrel ramuli. CERAMIUM (*Roth.*)—from *κεραμος*, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *echionotum*; frond slender, of nearly equal diameter throughout, rigid, repeatedly dichotomous, frequently with lateral forked branchlets, fastigiate, the apices more or less involute; articulations pellucid, those of the middle of the stem three or four times longer than broad, the upper gradually shorter, the uppermost extremely short; dissepiments coloured, armed with numerous, slender, irregularly inserted, subulate, colourless, one-jointed prickles; tetraspores mostly solitary in each joint, erumpent, along the outer margin of the filament; favellæ mostly bilobed, lateral, subtended by numerous, strongly incurved ramuli.

CERAMIUM *echionotum*. *J. Ag. Advers.* p. 27.

HAB. On rocks and stones, between tide marks; and in tidal pools parasitic on various Algæ. Annual. Summer and autumn. Common in several places. Torbay *Mrs. Griffiths*. Plymouth, *Messrs. Hore* and *Rohloff*. Youghal, *Miss Ball*. North of Ireland, *Mr. W. Thompson*. West of Ireland, *W.H.H.*

GEOGR. DISTR. Coasts of Europe, both Atlantic and Mediterranean.

DESCR. *Fronds* capillary, densely tufted, three to six inches long, harsh and rigid to the touch, of nearly equal diameter throughout or slightly attenuated upwards, many times dichotomous, frequently furnished with lateral, repeatedly forked, short branchlets, fastigiate. *Axils* patent in all parts of the frond. *Apices* more or less strongly hooked inwards. *Articulations* at first filled with a pale pink fluid, at length colourless, cylindrical, those of the lower part of the frond several times longer than broad, the upper gradually shorter. *Dissepiments* coated with a broad, clearly defined band of minute coloured cellules, armed with more or less numerous, irregularly inserted, slender, brittle, acicular, colourless, one-jointed prickles. *Tetraspores* confined to the outer edge of the filament, one, or rarely two, in each dissepiment, prominent, with wide pericarps. *Favellæ* generally near the apices of the frond, or of the lateral ramuli, often placed in the fork, and subtended by an involucre formed of several, involute ramuli. *Colour* of the tufts, a more or less deep purplish-red. *Substance* rigid, imperfectly adhering to paper.

Mrs. Griffiths has for many years regarded the plant here figured, as being distinct from *C. ciliatum*, from which the nature and disposition of the prickles that clothe the joints in greater or less number at once distinguish it. In *C. ciliatum* there is a regular whorl of stout three-jointed prickles, all pointing upwards, round the centre of every joint; here we have several slender, one-jointed, needle-shaped prickles scattered irregularly and pointing in various directions like the spines of a sea-urchin, a resemblance which appears to have suggested the specific name under which Professor Agardh has described it. In young specimens the joints, at least the upper ones, are filled with a purplish fluid which makes the frond, while living, appear to be fully coloured, not diaphanous; when dried this fluid is dispersed and the true nature of the joint is obvious. Specimens from different quarters differ in some minor points, and possibly more than one species may still be confounded under this name, but the subject is one of great difficulty, and requires considerable observation of the living plant, during its whole course of growth.

Fig. 1. CERAMIUM ECHIONOTUM; a tuft, of the natural size. 2. Upper portion of a filament. 3. Apex, with tetraspores *in situ*. 4. Portion of a filament with involucre. 5. Involucre containing a bilobed *favella*. 6. A prickle.

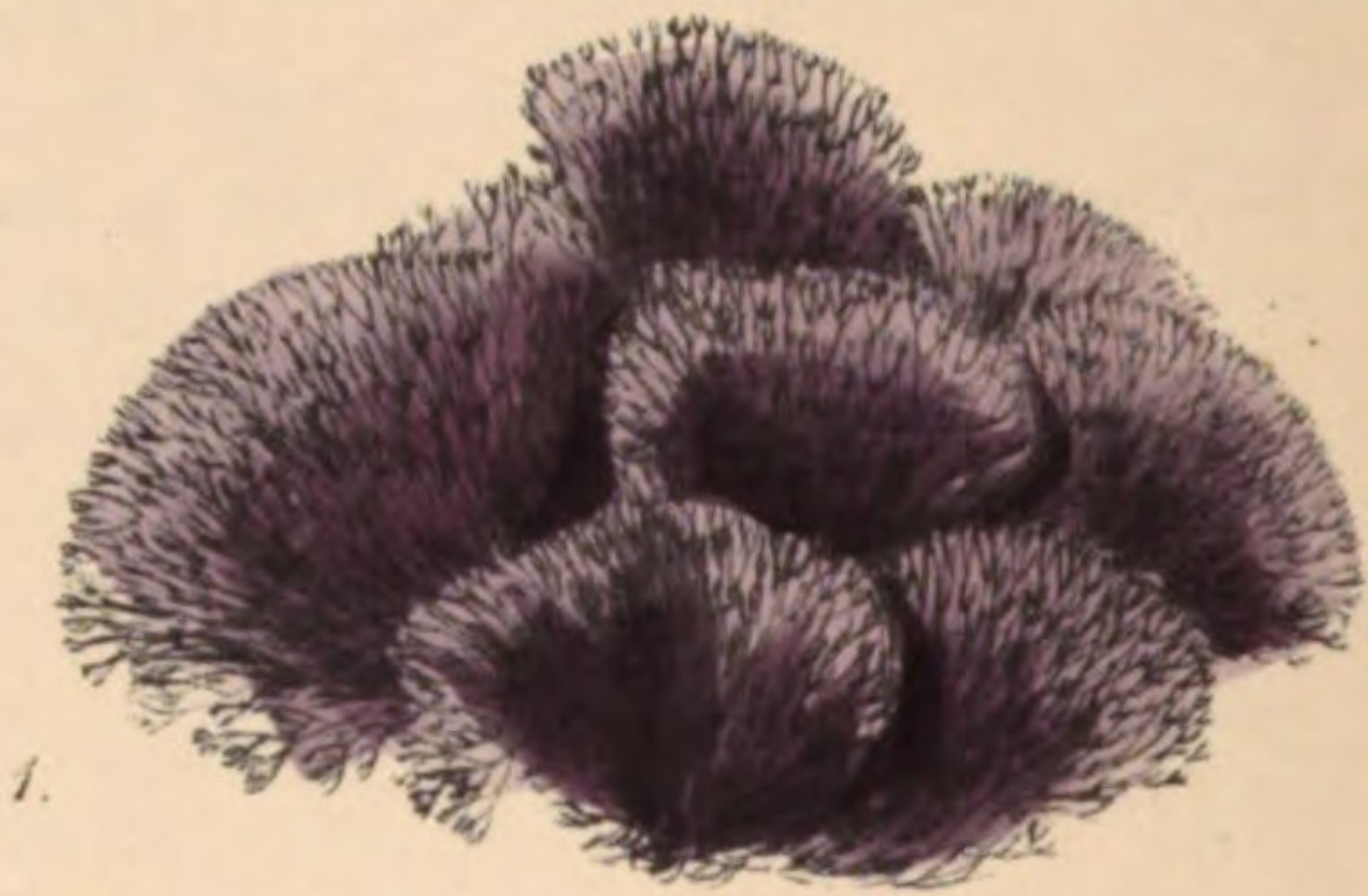


PLATE CXL.

CERAMIUM ACANTHONOTUM, *Carm.*

GEN. CHAR. *Frond* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth*),—from *κεραμος*, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *acanthonotum*; frond slender, of nearly equal diameter throughout, rigid, repeatedly dichotomous, fastigiate, the apices strongly involute; articulations pellucid, those of the middle of the stem several times longer than broad, the upper gradually shorter; dissepiments coloured, armed on the outer edge with a single robust, broadly subulate, coloured, three-jointed prickle; tetraspores erumpent, whorled round the joint; favellæ roundish, subtended by a solitary, incurved ramulus.

CERAMIUM *acanthonotum*, *Carm. Alg. Appin. ined. cum ic. J. Ag. Advers.* p. 26.

CERAMIUM *ciliatum*, β . *acanthonotum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 336. *Harv. Man.* p. 100.

ACANTHOCERAS *Shuttleworthianum*, *Kütz. in Linn.* t. 15. p. 739. *Kütz. Phyc. Gen.* p. 381. t. 46. f. 4.

HAB. On exposed rocks, near low-water mark, and on the smaller Algæ. Annual. Summer and autumn. Not uncommon. Appin, *Capt. Carmichael*. Aberdeen, *Dr. Dickie*. Torbay, *Mrs. Griffiths*, Plymouth, *Messrs. Hore and Rohloff*. Common in the west of Ireland, *W.H.H. Youghal, Miss Ball*.

GEOGR. DISTR. The British Islands.

DESCR. *Fronds* very densely tufted, when old forming intricate and often matted bunches, from two to six inches in diameter, slender, about as thick as human hair, of equal diameter throughout, excessively divided dichotomously and more or less furnished with lateral dichotomous branchlets; in old specimens these latter become in their turn repeatedly divided, and, issuing along the whole of the lower parts of the frond, serve to render the tufts so compact and closely matted, as they eventually become. *Axils* patent in all parts of the frond; *apices* strongly rolled inwards. *Articulations* colourless, cylindrical, those of the lower parts of the stem several times longer than broad; the upper gradually shorter, and the ultimate ones extremely short, many times shorter than broad. *Dissepiments* coated with a broad, deeply coloured, well-defined band of minute, angular cellules; each with a solitary, robust, coloured, three-jointed, broadly subulate, or deltoid, very acute prickle on its outer margin. *Tetraspores* very large, with broad pellucid pericarps, erumpent from the joint, whorled. *Favellæ* globose, lateral, subtended by a single, strongly incurved ramulus. *Colour* of the tufts dark purple. *Substance* rigid, imperfectly adhering to paper.

Ceramium acanthonotum was first distinguished by the late Capt. Carmichael, of Appin, in whose unpublished 'Algæ Appinenses' an excellent description and accurate figure are given. It is my fault that in the 'British Flora', and subsequent works, it appears only in the rank of a variety. Later observations, on several of our shores, and comparison of numerous specimens, from various quarters, have long since convinced me that it is a true species. Its colour is much darker than that of *C. ciliatum*, often an intense purple; and the tufts are usually shorter, and more densely compacted. These characters, however, are not sufficiently definite, and an appeal to the microscope may be necessary. This at once displays the admirable character by which the species may be recognized, namely, the *solitary*, three-jointed spine, arming the outer margin of every joint. The only other known British *Ceramium* which has a spine at all similar, is *C. flabelligerum*, but that is at once distinguished by its joints being coloured, not hyaline; not to speak of its very different branching, and the smallness of its spine.

Kützing, in his revision of the genus *Ceramium*, divides the species into six distinct genera, one of which he founds on the present individual, which he distinguishes generically from other ciliated *Ceramia* because its tetraspores are erumpent. As some of my readers may desire to know the *characters* attributed to this author's genera, they are here given.

HORMOCERAS. Frond jointed; cortical cells collected at the dissepiments in transverse zones; tetraspores immersed. (*C. diaphanum* and its allies; thirteen species enumerated.)

GONGROCERAS. Frond jointed; cortical cells collected at the dissepiments in transverse zones; tetraspores erumpent. (*C. Deslongchampsii*, and five others.)

ECHINOCERAS. Frond jointed, zoned and aculeated at the joints; tetraspores immersed. (*C. ciliatum*, and nine others.)

ACANTHOCERAS. Frond jointed, zoned and aculeated at the joints; tetraspores erumpent. (*C. acanthonotum*.)

CERAMIUM. Frond filiform, consisting of a jointed central axis, and a cortical, continuous layer of cells, destitute of cilia or spines; tetraspores immersed in the cortical layer. (*C. rubrum*, &c.)

CENTROCERAS. Frond as in *Ceramium*, but furnished at the joints with prickles or spikes; tetraspores erumpent. (*C. clavulatum*, and five others.)

Fig. 1. CERAMIUM ACANTHONOTUM:—tuft of the natural size. 2. Portion of a filament. 3. Small part of the same, with tetraspores. 3. Small portion of a filament, with a favella, in situ:—all more or less magnified.

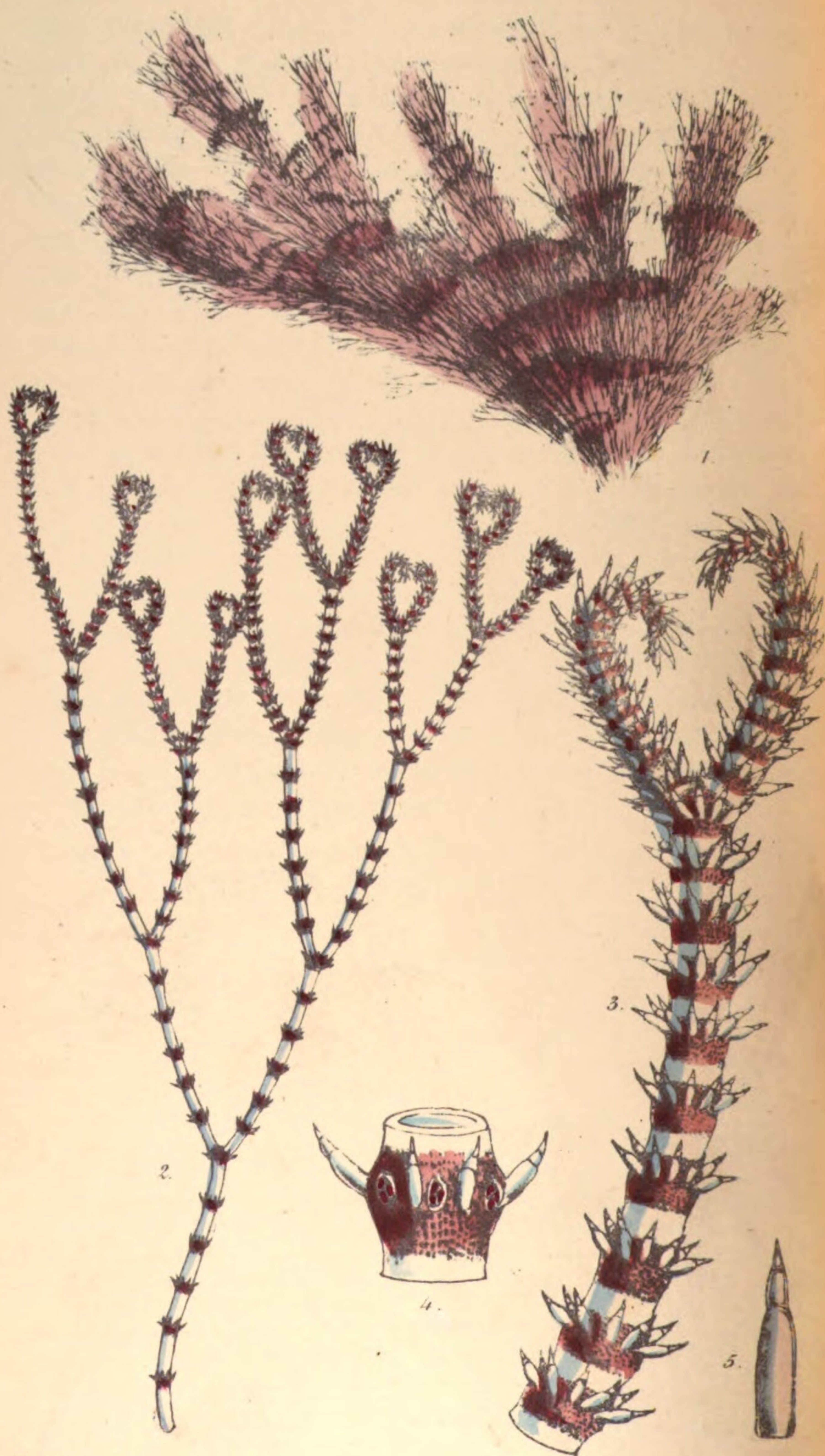


PLATE CXXXIX.

CERAMIUM CILIATUM, *Ducluz.*

GEN. CHAR. *Fronde* filiform, one-tubed, articulated; the dissepiments coated with a stratum of coloured cellules, which sometimes extend over the surface of the articulation. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores*, either immersed in the ramuli, or more or less external; 2, sessile, roundish *receptacles* (*favellæ*), having a pellucid limbus, containing minute, angular spores, and subtended by one or more short, involucral ramuli. CERAMIUM (*Roth.*),—from *κεραμος*, a *pitcher*, but the fruit is not pitcher-shaped.

CERAMIUM *ciliatum*; frond slender, of nearly equal diameter throughout, rigid, repeatedly dichotomous, with or without lateral branchlets, fastigiate, the apices strongly involute; articulations pellucid, those of the middle of the stem from three to four times longer than broad, the upper gradually shorter; dissepiments coloured, furnished with a whorl of robust, subulate, three-jointed prickles; tetraspores alternating with the prickles; favellæ subtended by two or three ramuli.

CERAMIUM *ciliatum*, *Ducluz. Ess.* p. 64. *Lyngb. Hyd. Dan.* p. 121. t. 37. *Ag. Sp. Alg.* vol. ii. p. 153. *Hook. Fl. Scot.* part 2. p. 14. *Grev. Fl. Edin.* p. 311. *Harv. in Hook. Br. Fl.* vol. ii. p. 336. *Harv. in Mack. Fl. Hib.* part 3. p. 211. *Harv. Man.* p. 100. *Wyatt, Alg. Danm.* no. 180. *J. Ag. Alg. Medit.* p. 81. *J. Ag. Advers.* p. 26. *Mont. Fl. Algier.* p. 145.

CERAMIUM *diaphanum*, var. *ciliatum*, *Duby, Bot. Gall.* p. 967. *Ag. Syst.* p. 134.

ECHINOCERAS *ciliatum*, *Kütz. in Linn.* vol. xv. p. 736. *Kütz. Phyc. Gen.* p. 380.

BORYNA *ciliata*, *Gratel. Bory, Dict. Class. Fl. Pelop.* p. 77.

CONFERVA *ciliata*, *Ellis, Phil. Trans.* vol. lvii. p. 425. t. 18. fig. *h. H.* *Huds. Fl. Ang.* p. 599. *Lightf. Fl. Scot.* p. 998. *With. Br. Pl.* vol. iv. p. 137. *Dillw. Conf.* p. 77. t. 53. *E. Bot.* t. 2428.

CONFERVA *pilosa*, *Roth. Cat. Bot.* vol. ii. p. 225. t. 5. f. 2.

HAB. On rocks and stones in the sea, either in tide pools or exposed at low water; also attached to Corallines and other Algæ. Annual. Summer. Not uncommon on the British shores, from Orkney to Cornwall.

GEOGR. DISTR. Dispersed throughout the Atlantic and Pacific Oceans, in temperate latitudes of the northern and southern hemisphere.

DESCR. *Fronde* forming dense tufts, from three to six inches in diameter, as fine as human hair, nearly of equal diameter throughout, rigid, harsh and rather brittle, repeatedly dichotomous, occasionally furnished with lateral dichotomous branchlets, fastigiate; the *apices* strongly hooked inwards; *axils* rather patent. *Articulations* colourless, those of the lower parts of the

filaments several times longer than broad, of the upper branches gradually shorter, and the uppermost joints extremely short. *Dissepiments* coated with a broad, coloured band of minute cellules, more or less clearly defined, furnished with a regular whorl of robust, subulate, colourless prickles, composed of three cells or joints, the lowest joint being twice as long as the other two; the uppermost very small and acute. *Tetraspores* not very prominent, disposed in a whorl round the joint, alternately with the prickles. *Favellæ*, according to Dillwyn, "roundish, lateral, nearly sessile, and mostly accompanied by three or four, short, incurved ramuli". *Colour* of the tufts a purplish-red. *Substance* membranaceous and rigid, imperfectly adhering to paper in drying.

Under the common name *ciliatum* at least three distinct varieties of *Ceramium*, now regarded as distinct species, have hitherto been confounded by British botanists. These I have brought together in the present number for the purpose of contrasting their characters. The excellent figures published by Ellis, and Dillwyn, and the descriptions given by those authors, leave us at no loss to decide to which of the three modern species their synonyme belongs. They appear to have had the present species solely in view. In Herbaria, on the contrary, the three are very frequently confounded together, and even in the excellent work of Mrs. Wyatt, specimens of *C. echionotum* are published in some of the copies, as *C. ciliatum*.

It is but just to state that my accurate friend Mrs. Griffiths has for many years been convinced of the distinctness of these plants and separated them in her own rich collection; and one of them was also well distinguished by the late Capt. Carmichael. To the naked eye they have very much the same appearance, and to the touch the same peculiarly harsh feel, and it is not till we submit small portions to the test of the microscope that their differences are perceived. Obvious differences may then be observed in the spines, with which the joints are armed, and these appear to be constant.

Fig. 1. CERAMIUM CILIATUM; tuft, of the natural size. 2. Portion of a filament. 3. Apex of the same. 4. A joint with tetraspores. 5. A prickle:—all more or less highly magnified.



PLATE XLVI.

SPYRIDIA FILAMENTOSA, *Harv.*

GEN. CHAR. *Fronde* filiform, cylindrical, much branched, traversed by a wide articulated tube, whose walls are composed of small, angular cells; *ramuli* setiform, simple, jointed. *Fructification* of two kinds on distinct individuals; 1, external *tetraspores*, with colourless borders, attached to the *ramuli*; 2, stalked, gelatinous, lobed *receptacles* (*favellæ*), involucred by short *ramuli*, and containing two or three distinct masses of roundish spores. SPYRIDIA (*Harv.*)—from *σπυρίς*, a basket.

SPYRIDIA *filamentosa*; frond irregularly branched, subopake; branches tapering at the base, more or less densely clothed with setaceous *ramuli*; joints of the stem very short, of the *ramuli* once and a half as long as broad.

SPYRIDIA *filamentosa*, *Harv.* in *Hook. Br. Fl.* vol. ii. p. 337. *Wyatt, Alg. Danm.* no. 88. *Harv. Man.* p. 101. *J. Ag. Alg. Medit.* p. 79. *Endl. 3rd. Suppl.* p. 35. *Kütz. Phyc. Gen.* p. 376. t. 48. *Mont. Pl. Cell. Canar.* p. 174.

SPYRIDIA *crassiuscula*, *Kütz. Phyc. Gen.* p. 376.

SPYRIDIA *setacea*, *Kütz. l. c.*

SPYRIDIA *nudiuscula*, *Kütz. l. c.*

FUCUS *filamentosus*, *Wulf. Cr. Aq.* p. 64.

FUCUS *friabilis*, *Clem. Ess.* p. 318.

CERAMIIUM *filamentosum*, *Ag. Sp. Alg.* vol. ii. p. 141.

HUTCHINSIA *filamentosa*, *Ag. Syst.* p. 159.

CONFERVA *Griffithsiana*, *E. Bot.* t. 2312.

HAB. On submarine rocks, near low-water mark. Perennial, Summer. Southern coasts of England, in several places; but rare. Southampton, *Miss Biddulph*. Torquay and Sidmouth, *Mrs. Griffiths*. Jersey, *Miss White*; *Miss Turner*. Aberfraw, Anglesea, plentiful; and Holyhead, *Mr. Ralfs*.

GEOGR. DISTR. Atlantic coasts of Europe from England to Spain. Abundant in the Mediterranean. East and West Indies. Canary Islands. Australia and Tasmania.

DESCR. *Root* a large disc-like expansion, half an inch or more in diameter. *Stems* tufted, many springing from the same base, from two to ten inches high, about half a line in diameter below, gradually attenuated upwards irregularly branched in a manner between dichotomous and alternate. In some specimens, an undivided stem, six to eight inches long, is densely beset with lateral branches spreading nearly horizontally, and diminishing in length as they approach the apex; the lowest being three to four inches

long, giving the frond an ovate outline, and bearing a second or third series of lesser branches. In others, the main stem is once or twice forked, and clothed throughout with short lateral branches of nearly the uniform length of an inch; and in others (as represented in our figure), the stem is irregularly forked, the lateral branches more erect, simple or divided, more or less fastigate, and the general outline of the tufts roundish. In all varieties the younger portions of the fronds are beset with more or less dense, hair-like, jointed ramuli about two lines in length, and issuing without order from all sides of the branch. Occasionally these are very few and the plant becomes *S. nudiuscula*, of Kutzing. *Tube* occupying two thirds of the breadth of the stem, divided into joints by transverse diaphragms, placed at short intervals; its walls cellular, and the external surface reticulated. *Tetraspores* elliptical, clustered round the bases of the ramuli. *Favellæ* bi-lobed, or rarely tri-lobed. *Colour* a dull red, very frequently faded, and yellowish white. *Substance*, of the stem cartilaginous, of the ramuli membranaceous.

This plant, which is very local on the British coasts, although found in considerable plenty in a few places, is interesting in a geographical view, being a native of warm latitudes which reaches to its northern limit in this country. Until very recently that Mr. Ralfs discovered it on the Welsh coast, it had only been found in Britain on the extreme southern shores. It is more plentiful in the Channel Islands, and along the French coast, and abounds in the Mediterranean; but the finest specimens are found in the Tropical ocean. In Britain it is very generally much discoloured, being of a dirty grey or brownish cast, a deformity caused by its growing in comparatively shallow water, and in places exposed to strong sunshine.

A plant so widely dispersed is, as might reasonably be supposed, subject to some variations of character, on which Kützing has proposed to found several distinct species. In the detailed description I have noticed some of these variations, which do not appear to me to be of specific value; and in a very extensive series of specimens from different localities I find innumerable intermediate forms. The most distinct looking variety, (and it may, perhaps, be admitted as a species) is found in Tasmania, and has the ramuli pretty constantly whorled, and much denser than usual.

Fig. 1. SPYRIDIA FILAMENTOSA:—*natural size*. 2. A transverse section of the stem. 3. Longitudinal semi-section of the same, 4. Branchlet with its ramuli, bearing tetraspores. 5. Ramulus with *tetraspores*. 6. Branchlet bearing *favellæ*. 7. A *favella*. 8. Spores from the same:—*all more or less magnified*.

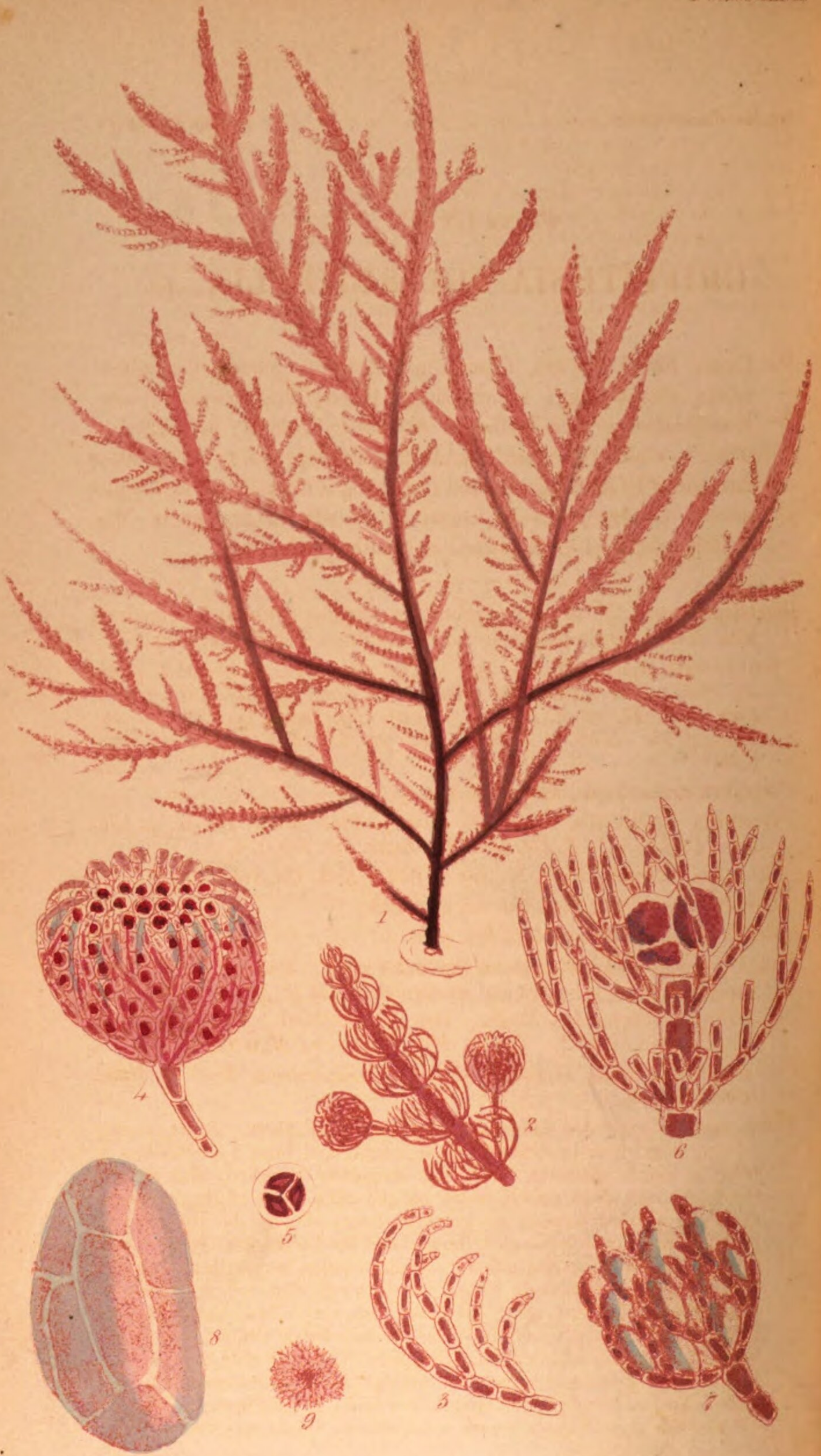


PLATE LXVII.

GRIFFITHSIA EQUISETIFOLIA, *Ag.*

GEN. CHAR. *Fronde* rose-red, filamentous; filaments jointed throughout, mostly dichotomous; ramuli single tubed; dissepiments hyaline. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores* affixed to whorled involucrel ramuli; 2, gelatinous *receptacles* (*favellæ*) surrounded by an involucre, and containing a mass of minute angular spores. GRIFFITHSIA,—so named by *Agardh*, in honour of Mrs. Griffiths, the most distinguished of British Algologists.

GRIFFITHSIA *equisetifolia*; stems robust, cartilaginous, whorled throughout with closely imbricated, incurved, many times dichotomous ramuli.

GRIFFITHSIA *equisetifolia*, *Ag. Syn.* p. 28. *Hook. Fl. Scot.* part 2. p. 84. *Ag. Syst.* p. 143. *Grev. Fl. Edin.* p. 312. *Ag. Sp. Alg.* vol. ii. p. 133. *Hook. Brit. Fl.* vol. ii. p. 337. *Wyatt, Alg. Danm.* no. 181. *J. Alg. Medit.* p. 78. *Harv. in Mack. Fl. Hib.* part 3. p. 211. *Endl. 3rd Suppl.* p. 35.

HALURUS *equisetifolius*, *Kütz. Phyc. Gen.* p. 374.

CONFERVA *equisetifolia*, *Lightf. Fl. Scot.* p. 984. *With.* vol. iv. p. 133. *Dillw. Conf.* t. 54. *E. Bot.* t. 1479. *Esper. Fuc. Sup.* t. 4.

CONFERVA *imbricata*, *Huds. Fl. Ang.* p. 603. *Roth. Cat.* vol. iii. p. 281.

CONFERVA *cancellata*, *Roth. Cat.* vol. ii. p. 230.

CERAMIUM *equisetifolium*, *D.C. Syn.* p. 8.

HAB. On marine rocks, at extreme low water mark. Perennial. Summer. Frequent on the southern and western shores of England, and Ireland. Wales, common, *Mr. Ralfs*. Rare in Scotland. Frith of Forth, *Mr. Yalden (Lightf.)*. Jersey, *Miss White and Miss Turner*.

GEOGR. DISTR. Atlantic shores of Europe. Mediterranean Sea. Falkland Islands, *Agardh*.

DESCR. *Root*, an expanded callus, coated with shaggy fibres. *Stems*, mostly solitary, from three to nine inches in height, and from a quarter-line to nearly a line in diameter, much and irregularly branched, and clothed throughout with short ramuli, which on the older parts of the fronds are densely aggregated, forming an irregular shaggy pile, but on the younger parts they are regularly whorled, the apices of the lower whorls lying closely over the bases of those above them. Main branches long, either subsimple or once or twice irregularly forked, or repeatedly dichotomous, generally furnished with numerous short, spindle-shaped, simple branchlets, given off laterally, and at very uncertain distances, sometimes scattered along the branches, sometimes crowded round the apices. These are clothed throughout with whorled, dichotomous, incurved ramuli. Joints of the branches about twice as long as broad; of the ramuli, 3–4 times, swollen upwards. *Favellæ* borne on the tips of short branches, imperfectly involucrel, two or three

lobed, with a wide limbus, and containing masses of dark-red, angular spores. *Tetraspores* contained in spherical, pedicellate involucre composed of a whorl of dichotomous ramuli, borne along the sides of the branches. Besides these normal kinds of fruit, what appears to be an abnormal effort at fructification (or possibly *antheridia*?), is sometimes found; consisting of oval bodies, composed of bundles of excessively fine dichotomous filaments, contained in involucre similar to those occupied by tetraspores, and attached in the same manner as tetraspores are (fig. 7, 8, 9.). Colour when fresh, a dark full red, becoming brownish in drying. Substance firm, and somewhat cartilaginous.

Griffithsia equisetifolia was first described by Lightfoot in the year 1777, in his 'Flora Scotica', on the authority of a specimen communicated by Mr. Yalden from the Frith of Forth, and it is not a little remarkable that though the plant has been found on most parts of the English and Irish coasts, since Lightfoot's time, yet no more recent instance of its occurrence in Scotland has been recorded, nor have I received it from any of my Scotch correspondents.

While in fructification it perfectly agrees with others of the genus; it differs considerably in habit from all, with the exception of *G. simplicifilum*, a plant which ought, perhaps, rather to be considered as a slender variety of the present, than as a distinct species.

The curious bodies which I have noticed in the description under the name of *antheridia*, and introduced into the plate, were communicated to me by Mrs. Griffiths, who discovered them last year, on some specimens collected many years ago at Torquay. They are of a very anomalous nature, which in the present state of our knowledge it is impossible to explain. Similar bodies are frequently produced by *G. setacea*, on which they were first noticed by Miss Biddulph; and are found on so many species of *Callithamnion*, that one is tempted to anticipate their being detected upon all. Should this prove to be the case, it will certainly favour the idea of their analogy with *antheridia*, and discredit the notion which I have hitherto entertained, namely, that they are a viviparous state of tetraspores.

Fig. 1. GRIFFITHSIA EQUISETIFOLIA:—the natural size. 2. Portion of a branch, and two involucre. 3. A ramulus. 4. An involucre. 5. A tetraspore. 6. Apex of a branch, with a favella. 7. Involucre producing *antheridia*?. 8. An *antheridium*? 9. Fragment of the same:—all more or less highly magnified.

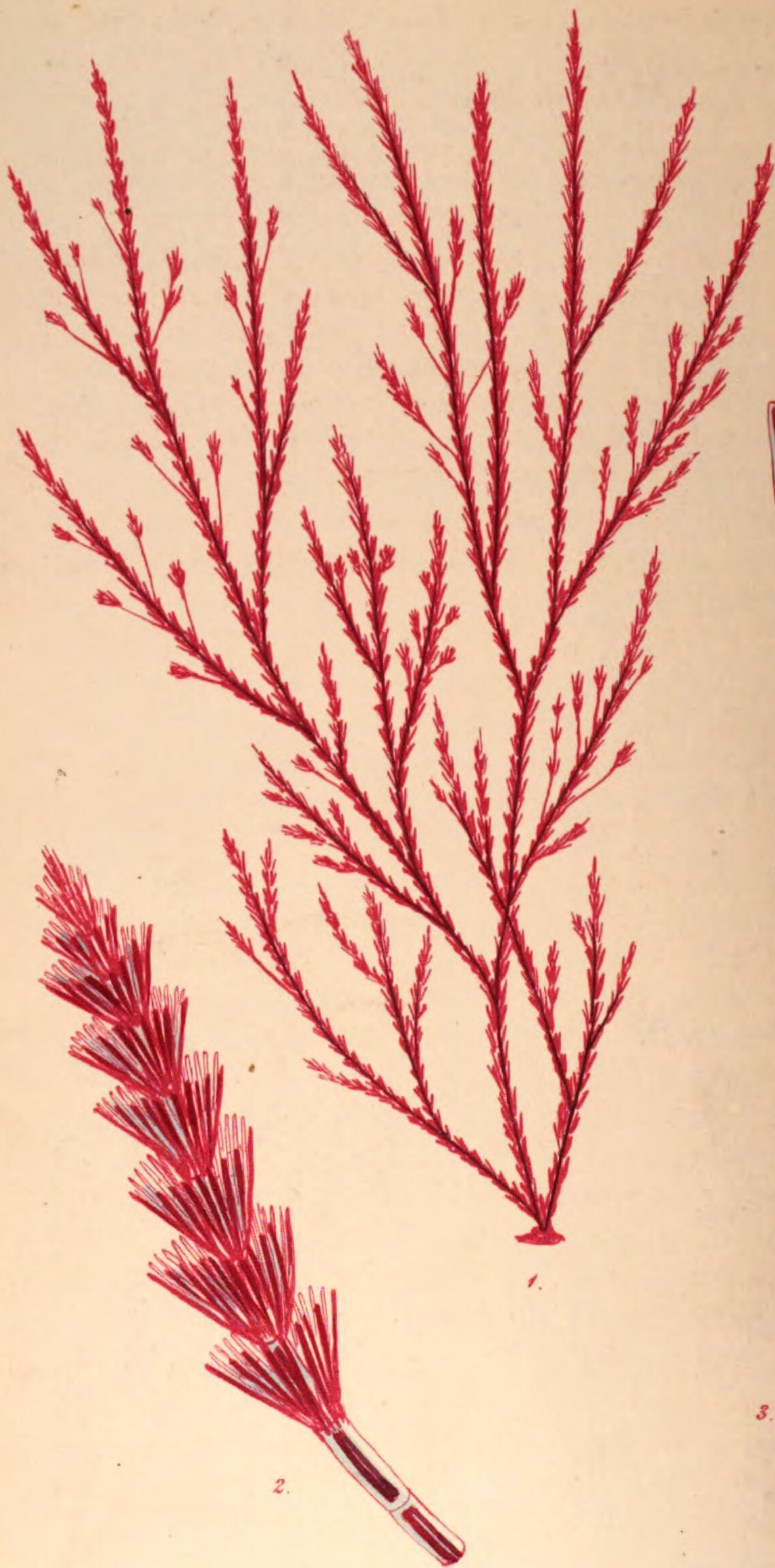


PLATE CCLXXXVII.

GRIFFITHSIA SIMPLICIFILUM, *Ag.*

GEN. CHAR. *Frond* rose-red, filamentous; filaments jointed throughout, mostly dichotomous; ramuli single tubed; dissepiments hyaline. *Fructification* of two kinds, on distinct individuals; 1, *tetraspores* affixed to whorled involucreal ramuli; 2, gelatinous *receptacles* (*favellæ*) surrounded by an involucre, and containing a mass of minute angular spores. GRIFFITHSIA (*Ag.*) in honour of *Mrs. Griffiths*, the most distinguished of British Algologists.

GRIFFITHSIA *simplicifilum*; stems slender, irregularly branched, whorled with imbricated, straight, once-forked ramelli.

GRIFFITHSIA *simplicifilum*, *Ag. Sp. Alg.* vol. ii. p. 134. *Harv. in Hook. Journ. Bot.* vol. i. p. 301. pl. 139. *Harv. in Mack. Fl. Hib.* part iii. p. 212.

CERAMIIUM *simplicifilum*, *D.C. Fl. Gall. Syn.* p. 8.

HALURUS *simplicifilum*, *Kütz. Sp. Alg.* p. 663.

HAB. On rocks, &c., near low water-mark, and at a greater depth. Annual. Very rare. On rocks near Black Castle, Wicklow, and among rejectamenta at Ardinary Point, county Wicklow. *W.H.H.* Coast of Norfolk, *Rev. W. S. Hore.* Jersey, *Miss Turner.*

GEOGR. DISTR. Atlantic shores of France.

DESCR. *Root* clothed with matted and tangled fibres. *Stem* from four to eight or ten inches long, slender, much and irregularly branched; the branches erect, long, straight, virgate, closely whorled throughout with short ramelli. In some specimens the secondary branches are destitute of lateral branches; in others they are more or less densely set with short rudimentary branches, which are sometimes naked below, and having whorled ramelli above, and sometimes clothed with ramelli throughout. *Ramelli* from one to three lines in length, slightly imbricated, several in a whorl; straight, very erect, mostly forked near the base; rarely twice or thrice dichotomous. *Articulations* of the branches about thrice as long as broad; of the ramelli from eight to twelve times as long as broad, having a narrow band of colour with a wide hyaline border. *Fructification* not known, but probably similar to that of *G. equisetifolia*. *Colour* a bright pinky-red, given out quickly on immersion in fresh water. *Substance* membranaceous, adhering to paper, but not very strongly.

The characters by which this plant is to be known from *G. equisetifolia* are, the more slender branches, the more distant and less frequently forked, and straighter ramuli, and the greater proportionate length of the articulations. Usually the

colour of *G. simplicifilum* is much brighter than that of *G. equisetifolia*, but this character is not always to be depended upon. Perhaps the other differences mentioned are equally uncertain, and then this supposed species would be reckoned but a slender variety of *G. equisetifolia*, whose peculiar aspect was due to local circumstances. I have usually observed *G. equisetifolia* on rocky shores, exposed to considerable surf, while the most abundant locality for *G. simplicifilum*, and where it keeps all its peculiar characters without change, is on the extensive sandy beaches of Wexford, in comparatively quiet water.

Fig. 1. GRIFFITHSIA SIMPLICIFILUM:—*the natural size*. 2. Portions of a branch, *magnified*. 3. One of the ramelli:—*highly magnified*.



PLATE CCLXXXI.

GRIFFITHSIA BARBATA, Ag.

GEN. CHAR. *Frond* rose-red, filamentous; *filaments* jointed throughout, mostly dichotomous; *ramuli* single-tubed; *dissepiments* hyaline. *Fructification* of two kinds, on distinct individuals: 1, *tetraspores* affixed to whorled involucrel *ramuli*: 2, gelatinous *receptacles* (*favellæ*), surrounded by an involucre, and containing a mass of minute angular spores. GRIFFITHSIA—so named by Agardh, in honour of Mrs. Griffiths of Torquay, the most distinguished of British Algologists.

GRIFFITHSIA *barbata*; *filaments* dichotomous, slender; *articulations* slightly pyriform, from five to eight times longer than broad, those near the apices of the branches emitting opposite or whorled, byssoid, dichotomous fibres (or *ramuli*) to which the *tetraspores* are attached; *favellæ* stalked.

GRIFFITHSIA *barbata*, Ag. Syst. p. 145. Ag. Sp. Alg. vol. ii. p. 132. Harv. in Hook. Br. Fl. vol. ii. p. 338. Harv. Man. ed. 1. p. 102. Kütz. Sp. p. 660.

CONFERVA *barbata*, E. Bot. t. 1814.

HAB. Parasitical on the smaller Algæ, in tide-pools. Annual. Summer. Very rare, and seemingly confined to the coasts of the British Channel. Beach at Brighton, Mr. Borrer. Jersey, Miss Turner.

GEOGR. DISTR. North coast of France; not uncommon in old oyster-beds, attached to the shells and to small stones, *Lenormand*.

DESCR. *Fronds* one to three inches high, as thick as hog's bristle below, capillary and byssoid above, forming dense, fastigate tufts, repeatedly and pretty regularly dichotomous; the lower axils rather distant and patent, the upper close together and very acute. All the lower part of the frond is bare of *ramuli*; but the *articulations* of the terminal *ramuli* give off throughout from their apices, opposite, or whorled, very slender, byssoid, dichotomous, spreading *ramelli*. *Articulations* from five to eight times as long as broad, slightly swollen upwards, or nearly cylindrical. *Favellæ* pedunculate, formed out of truncate branches, binate, surrounded by numerous, simple or forked, involucrel *ramuli*. *Tetraspores* spherical, attached to the byssoid fibres that issue from the upper *articulations*, one *tetraspore* generally on each dichotomous fibre. *Colour* a fine, clear rose-red, changing to orange in fresh water. *Substance* tender and lubricous, most closely adhering to paper in drying.

I am indebted to Miss Turner, of Jersey, for beautiful specimens of this exceedingly rare plant, with both kinds of fructification—from some of which specimens the figure here offered

has been prepared. It is only necessary to glance at that figure, and compare it with the other species of *Griffithsia* figured in previous plates of this work, to see the strong characters by which the present is known from all the others. Here the few last articulations of all the branches are furnished with slender, byssoid fibres, and on these fibres the tetraspores are borne. In tenuity of frond there is a resemblance to *G. Devoniensis*, and in the pyriform articulations to *G. corallina*, but the byssoid ramuli are peculiarly its own.

G. barbata was discovered by Mr. Borrer, many years ago, cast ashore on the beach at Brighton, and for a long time our knowledge of the species rested solely on the few specimens so picked up. It is only recently that the plant has been found growing on the shores of the Channel Islands and of the north of France—the only localities hitherto recorded. One would hope that a more accurate exploration of the southern coasts of England and Ireland would, in a favourable season, reward the algologist with a new locality for so rare and so beautiful a plant.

Fig. 1. GRIFFITHSIA BARBATA :—*the natural size*. 2. Part of a frond, bearing tetraspores. 3. Apex of a branch of the same. 4. A tetraspore, attached to a fibre. 5. Part of frond with favella. 6. The favella removed. 7. Spores from the same :—*magnified*.

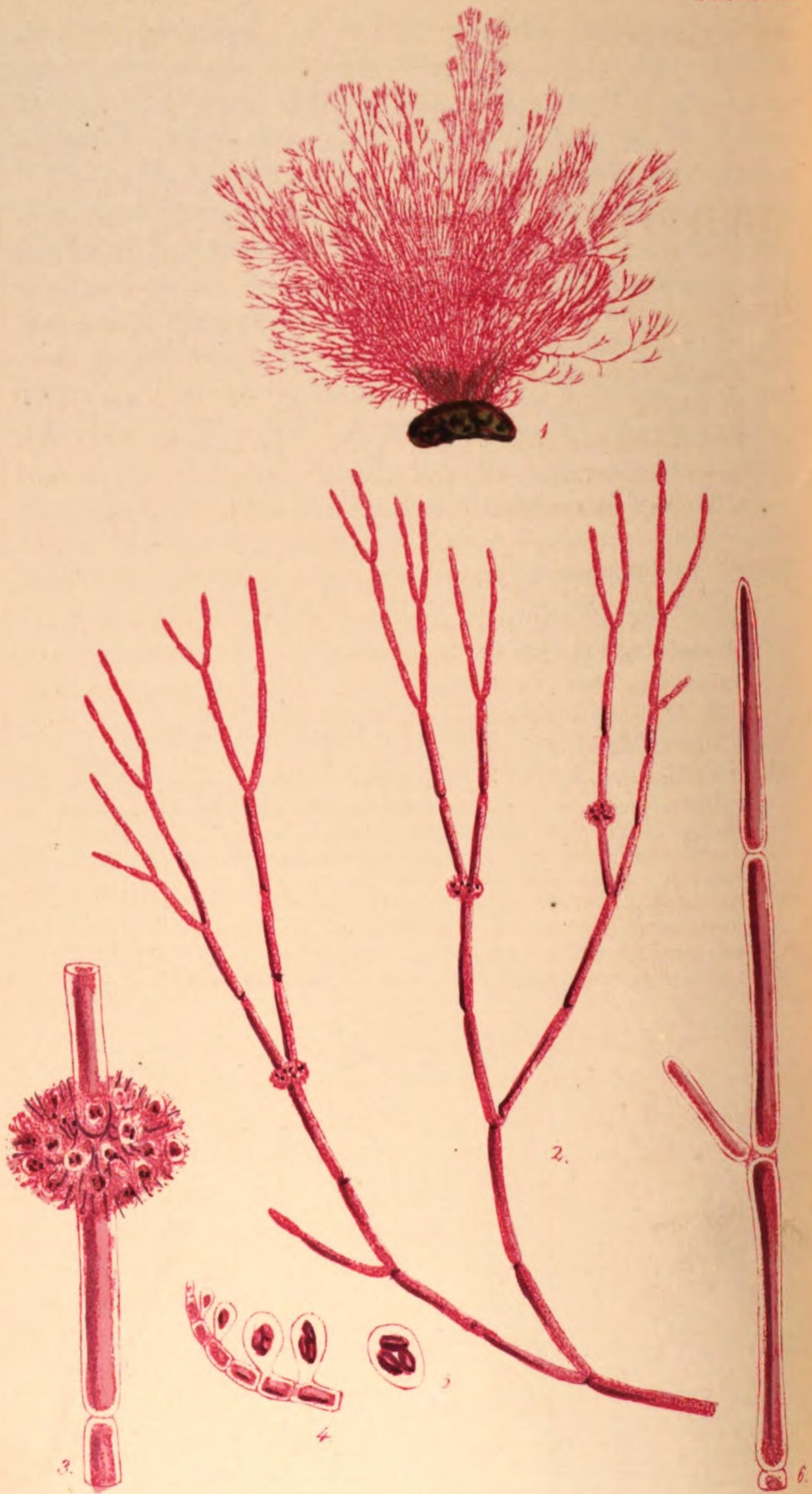


PLATE XVI.

GRIFFITHSIA DEVONIENSIS, *Harv. (n.sp.)*

GEN. CHAR. *Frond* rose-red, filamentous; *filaments* jointed throughout, mostly dichotomous; ramuli single-tubed; dissepiments hyaline. *Fructification* of two kinds, on distinct individuals: 1, *tetraspores* affixed to whorled involucral ramuli; 2, gelatinous *receptacles* (*favellæ*), surrounded by an involucre, and containing a mass of minute angular spores. GRIFFITHSIA—so named by Agardh, in honour of Mrs. Griffiths of Torquay, the most distinguished of British Algologists.

GRIFFITHSIA *Devoniensis*; filaments very slender, gelatinous, flaccid, dichotomous, the lower axils patent, the upper acute; articulations cylindrical, 7–8 times as long as broad; joints constricted; involucre whorled round the joints of the branches.

HAB. Muddy sea-shores, in deep water: rare. Plymouth, *Rev. W. S. Hore* (July 1840). At Salcombe, *Mrs. Wyatt* (Sep. 1840).

GEOGR. DISTR. South of England.

DESCR. *Filaments* 2–3 inches high, tufted, very slender, dichotomously divided, fastigate, the lower axils very patent, the upper acute; branches mostly naked, but sometimes throwing out short, root-like, lateral branchlets. *Substance* soft and gelatinous, closely adhering to paper, and having a gloss when dry. *Articulations* many times longer than broad, cylindrical, slightly incrassated at each end; the joints constricted. *Tetraspores* affixed to the inner face of short involucral ramuli which are densely whorled round the main filaments, at the apex of an articulation, where they form roundish masses. *Favellæ* unknown. *Colour* rose-red, soon discharged in fresh-water.

This graceful little plant, which appears different from all the species of *Griffithsia* yet described, was discovered in the summer of 1840, by the Rev. Mr. Hore, at Plymouth; and, in the autumn of the same year, added to the flora of Devonshire by Mrs. Wyatt. I record this latter habitat in the specific name because it affords me an opportunity, of which I gladly avail myself, to connect the name of Mrs. Griffiths with that of the county whose shores she has so long and so successfully explored, where the best part of her life has been spent, and the natural history of which, in all its varied branches, her researches have so greatly advanced.

G. Devoniensis obviously belongs to the section of the genus typified by *G. corallina*, from which species the smaller size, more

slender filaments, and cylindrical articulations sufficiently distinguish it. It agrees better in these respects with the rare *G. barbata*, but differs in its inflorescence, if I may venture to use that term to express the disposition of fruit.

The genus *Griffithsia*, proposed by Agardh, in 1824, has been universally adopted by botanists, and now includes nearly thirty species, scattered through the seas of all temperate climates, and reaching even to the troubled ocean of Cape Horn. One species is tropical; several of great beauty are found in the Mediterranean; and the shores of Australia, the Cape of Good Hope, and Western South America contribute others. All the species possess a common property, that of being exceedingly impatient of the contact of fresh water. To secure well-preserved specimens they should be brought home in salt water, and kept in it till they can be laid on paper. A short exposure to air is sufficient to decompose them, and fresh water causes the membrane of the cells to burst, and the colouring matter to be discharged with violence, as well described by Dr. Drummond in Loudon's Magazine of Natural History.

The genus is nearly allied to *Callithamnion*, and still more nearly to *Wrangelia*, from which latter it is chiefly distinguished by having the tetraspores involucreted.

Fig. 1. GRIFFITHSIA DEVONIENSIS :—*natural size*. 2. Upper portion of a filament. 3. Involucre. 4. Ramulus of ditto, shewing the position of the tetraspores. 5. A tetraspore. 6. Apex of a filament, to show the form of the articulations :—*all more or less magnified*.

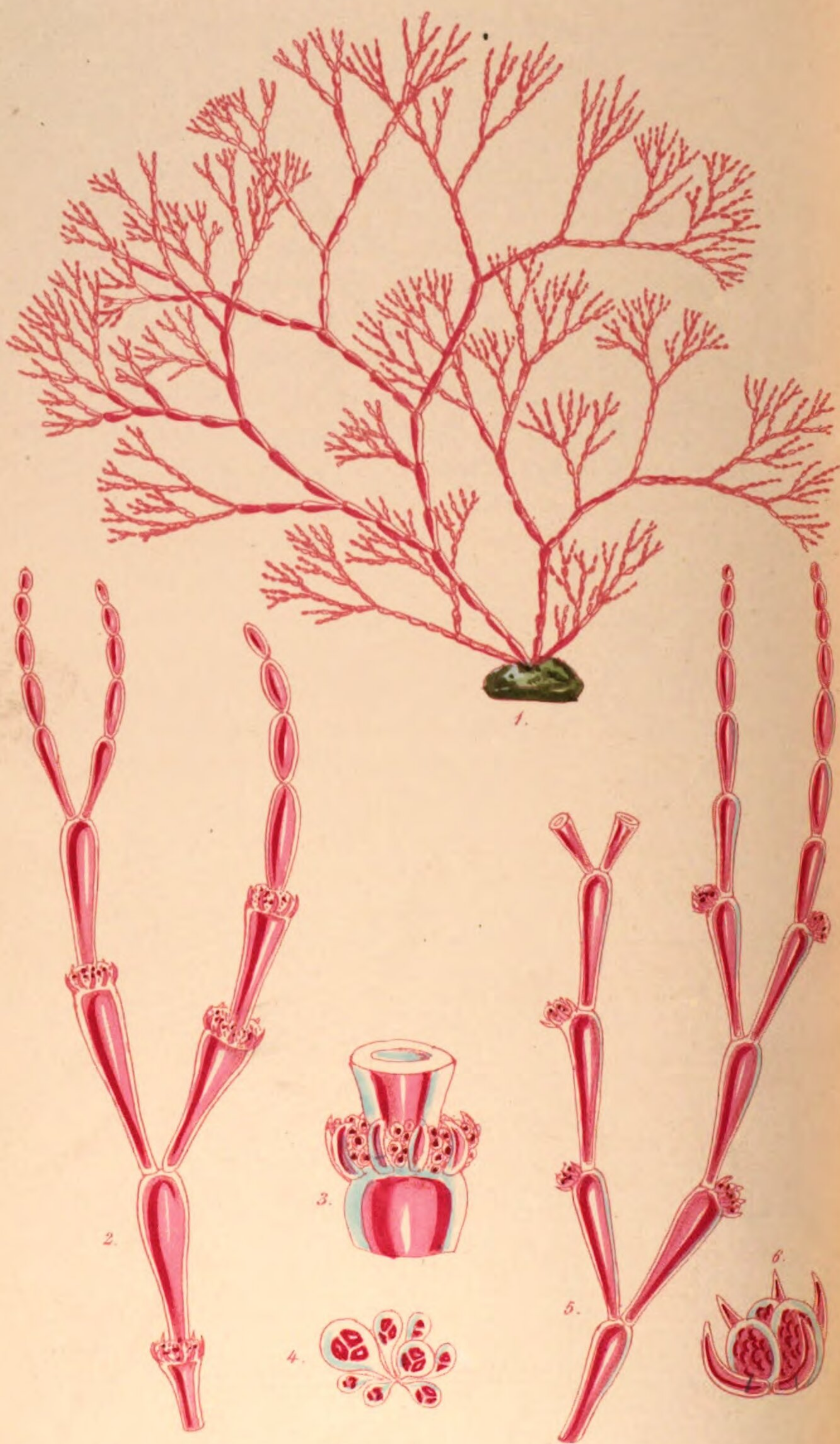


PLATE CCXIV.

GRIFFITHSIA CORALLINA, *Ag.*

GEN. CHAR. *Frond* rose-red, filamentous; filaments jointed throughout, mostly dichotomous; ramuli single tubed; dissepiments hyaline. *Fructification* of two kinds on distinct individuals; 1, *tetraspores* affixed to whorled involucre, ramuli; 2, gelatinous *receptacles* (*favellæ*), surrounded by an involucre, and containing a mass of minute, angular spores. GRIFFITHSIA (*Ag.*),—in honour of *Mrs. Griffiths*, the most distinguished of British Algologists.

GRIFFITHSIA *corallina*; filaments dichotomous, incrassated, gelatinous; axils patent; joints swollen upwards, pear-shaped, the ultimate ellipsoid; involucre sessile, those containing tetraspores whorled round the branch, those containing favellæ lateral.

GRIFFITHSIA *corallina*, *Ag. Syn.* p. 28. *Hook. Fl. Scot.* part 2. p. 84. *Ag. Syst.* p. 145. *Ag. Sp. Alg.* vol. ii. p. 127. *Harv. in Hook. Br. Fl.* vol. ii. p. 338. *Harv. in Mack. Fl. Hib.* part 3. p. 212. *Harv. Man.* p. 103. *Wyatt, Alg. Danm.* no. 89. *Kütz. Phyc. Gen.* p. 374. *Endl. 3rd. Supp.* p. 35.

CALLITHAMNION *corallinum*, *Lyngb. Hyd. Dan.* p. 126.

CONFERVA *corallina*, *Linn. Sp. Pl.* p. 1636. *Lightf. Scot.* p. 988. *With.* vol. iv. p. 136. *Mohr. Isl.* p. 250. *Roth. Cat. Bot.* vol. iii. p. 225. *Dillw. Conf.* t. 98. *E. Bot.* t. 1825.

CONFERVA *corallinoides*, *Linn. Sp. Pl.* ed. i. p. 1166. *Huds. Fl. Ang.* p. 598.

CONFERVA *geniculata*, *Ellis, in Phil. Trans.* vol. lvii. p. 425. t. 18. fig. F. f.

CONFERVA *marina gelatinosa*, *corallinae instar geniculata crassior*, *Dill. Musc.* vol. xxxiii. t. 6. f. 36.

HAB. On rocks near low-water mark, generally in deep pools. Annual. Summer. Not uncommon on the British shores from Orkney to Cornwall.

GEOGR. DISTR. Atlantic and Mediterranean shores of Europe. Færoe Islands. Iceland. North America. Tasmania.

DESCR. *Root* discoid. *Fronds* tufted, from two to six or eight inches in length, thicker than hogs' bristles, repeatedly and pretty regularly dichotomous, fastigate; the lesser branches more irregular, often alternate, slenderer than the rest of the frond, and tapering to a point. *Axils* in the lower part of the frond very wide, in the upper more and more narrow. *Articulations* two to four times longer than broad, more or less swollen upwards, those near the base of the stems somewhat cylindrical, those of the medial portions regularly pear-shaped, narrow at their lower extremity, and very wide above; the uppermost elliptical, connected in moniliform strings. *Dissepiments* hyaline and, as well as the border of the articulation, broad. *Fructification*: 1, *tetraspores* densely clustered in whorls round the joints, and surrounded by an involucre of short ramuli, very unequal in size, small

and large growing from the same point, attenuated at the base into a slender stalk; *favellæ* two or three together, sessile at the apex of an articulation, lateral, occupying the place of a suppressed branch of the stem, surrounded by short ramuli; each containing numerous ellipsoid granules. *Colour* a fine rosy crimson, freely given out in fresh water. *Substance* gelatinous and lubricous, closely adhering to paper in drying. *Smell* strong and peculiarly disagreeable.

This is one of those beautiful and not very uncommon plants which can scarcely fail to attract the notice of the observer who has once made the marine flora his study. We consequently find it among the species which soonest attracted notice. It is one of the few marine *Confervæ* figured by Dillenius, and having a place in the early editions of Linnæus. The clear red of its glossy, beaded fronds is well expressed in the specific name *corallina*, bestowed on it from an early period.

Few of our *Ceramieæ* have a wider range than *Griffithsia corallina*. It is found in every part of the European waters from the shores of Iceland to those of Italy, and I have received magnificent specimens from the shores of Van Dieman's Land. These last are so much larger and stronger than the majority of British grown fronds, that I at one time considered them distinct, and described them under the name *G. flabelliformis*; but on comparing them afresh with a suite of specimens, and especially with some very fine ones from the West of Ireland, I find that the distinctions formerly insisted on cannot be maintained. A considerable difference in the amount of upward-swelling of the joints exists in different specimens. This character is generally more developed in the larger than in the small individuals.

Fig. 1. GRIFFITHSIA CORALLINA:—*of the natural size.* 2. Portion of a branch with tetraspore-involucres. 3. One of the involucres. 4. Tetraspores. 5. Portion of a branch with favellæ. 6. Favellæ, with involucral ramuli:—*all more or less magnified.*

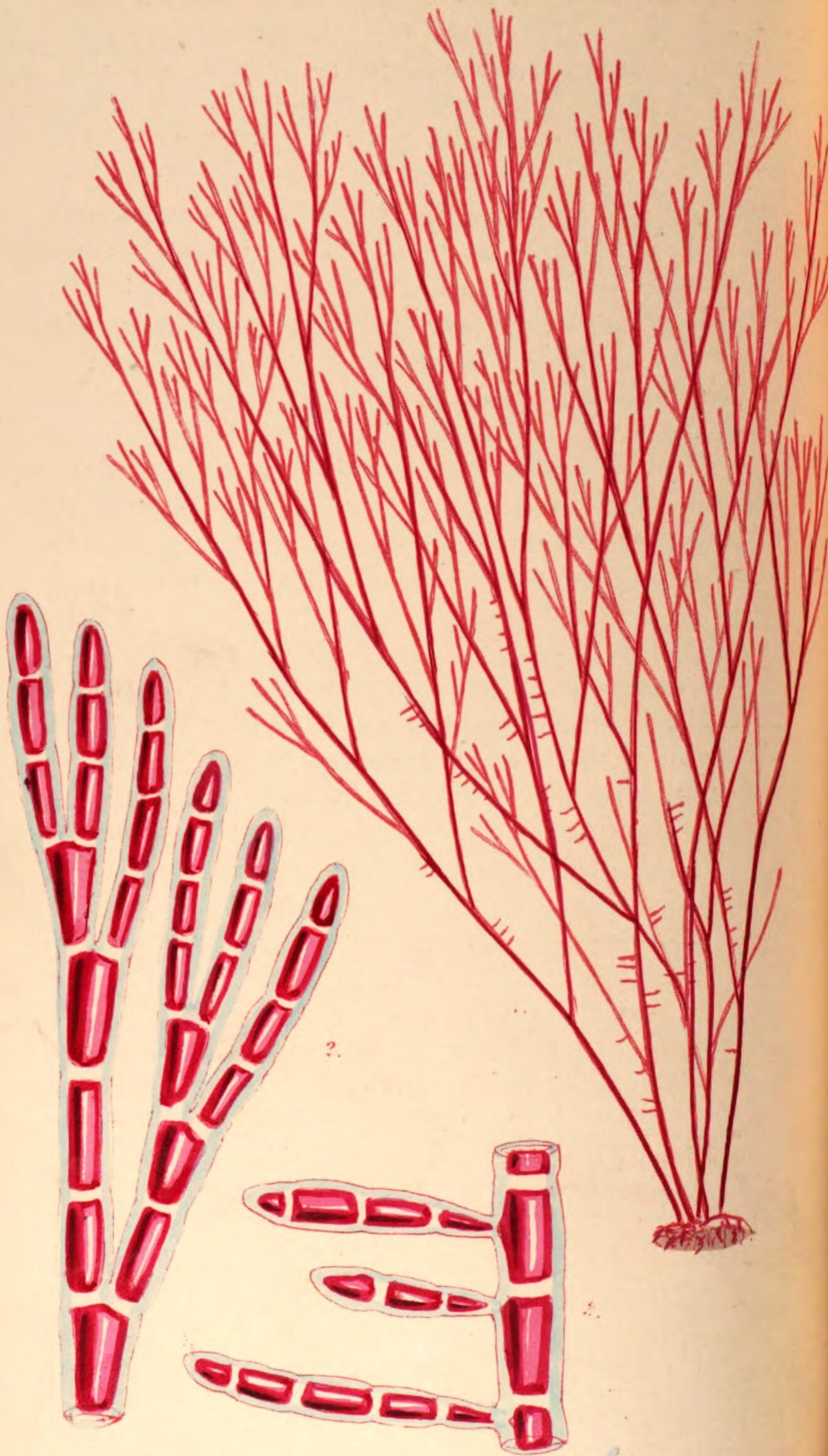


PLATE CLXXXV.

GRIFFITHSIA SECUNDIFLORA, *J. Ag.*

GEN. CHAR. *Frond* rosy-red, filamentous; filaments jointed throughout, mostly dichotomous; ramuli single-tubed; dissepiments hyaline. *Fructification* of two kinds on distinct individuals; 1, *tetraspores* affixed to whorled involucre, 2, gelatinous *receptacles* (*favellæ*) surrounded by an involucre, and containing a mass of minute, angular spores. GRIFFITHSIA (*Ag.*),—in honour of *Mrs. Griffiths*, the most distinguished of British Algologists.

GRIFFITHSIA *secundiflora*; filaments ultra-setaceous, somewhat gelatinous but firm, irregularly dichotomous, the lesser divisions flabellate; axils acute; branchlets fastigate, obtuse, not tapering to a point; articulations cylindrical, two to four times as long as broad, with a very wide border; "involucre on very short, lateral peduncles."

GRIFFITHSIA *secundiflora*, *J. Ag. in Linn.* vol. xv. p. 39. *Alg. Medit.* p. 75. *Mont. Alger.* p. 141. *Endl. 3rd Supp.* p. 35.

GRIFFITHSIA *crassa*, *Kütz. Phyc. Gen.* p. 374.

GRIFFITHSIA *intermedia*, *Lenorm. in Herb.*

GRIFFITHSIA *corallina* β . *Bonn. Hyd. loc.* p. 96.

CERAMIIUM *corallinum*, var. *majus*, *Desmaz. Crypt. Fr.* no. 1032.

CERAMIIUM *Desmazieri*, *Crouan, MS.*

HAB. On rocks, at extreme low-water mark. Perennial? Discovered at Bovisand, near Plymouth, August, 1846, by the *Rev. W. S. Hore*.

GEOGR. DISTR. Atlantic coasts of France and Spain. Mediterranean Sea.

DESCR. *Filaments* originating in branched, decumbent, matted fibres; tufted, four to eight inches high, thicker than hog's bristle, not sensibly attenuated upwards, generally simple below for the space of one or two inches, afterwards repeatedly and more or less closely dichotomous, with somewhat of a fan-shaped outline; the lesser divisions not regularly forked but often alternately or secundly divided: all the divisions very erect, and the axils, especially the upper ones, narrow and acute. Lesser branches and ramuli not tapering upwards, and very blunt. *Articulations* with a very wide pellucid border and narrow endochrome, cylindrical or sometimes obscurely pyriform, the lowermost about four times, the upper about twice as long as broad. *Fructification* not as yet seen on British specimens. *Colour* a fine, full crimson, quickly discharged, with rupture of the membrane and curving of the branches, in fresh water. *Substance* between gelatinous and membranaceous, firm, closely adhering to paper in drying. Short, horizontal, secund, root-like ramuli, often issue from the lower part of the branches.

This noble species, one of the finest of the section to which it belongs, was added to the British Flora, in the year 1846, by the *Rev.*

W. S. Hore, who had the good fortune about the same time to discover a new species (*G. Devoniensis*) of this charming genus, which is already figured in our first volume. I delayed the publication of the present novelty in the hope that its fructification might be detected on British specimens; but this hope having hitherto been disappointed, I do not wish further to delay introducing so interesting a plant to British botanists, although my figure wants a representation of the fruit. I could certainly have figured *fruit* from an exotic specimen, had I thought it expedient to do so. The *favellæ* resemble those of *G. setacea*, but are raised on much shorter peduncles

From *G. setacea* this plant may, at once, be known by its larger size, its comparatively shorter joints, and more lubricous substance; but especially by the very obtuse, cylindrical, upper ramuli, which do not taper to a point, but are of equal diameter throughout. From *G. corallina*, which in many respects it resembles, its cylindrical articulations and different inflorescence distinguish it.

G. secundiflora, though first noticed as a variety by Bonnemaison, was not well understood until the younger Agardh pointed out its characters, and clearly distinguished it from *G. setacea* and *G. corallina*, to one or other of which it had formerly been referred. It is one of the most common of the genus in the Mediterranean, from several parts of which sea I have received specimens. It occurs less commonly on the coasts of France and Spain, and reaches its northern limit on the coast of England, in the same locality that produces the equally southern *Stenogramme* and *Carpomitra*. Dr. Hooker brought from the Falkland Islands specimens which we at first referred to this species; but which, as they offer some points of difference, we now regard, provisionally, as a distinct species (*G. antarctica*).

Fig. 1. GRIFFITHSIA SECUNDIFLORA:—*of the natural size*. 2. Apex of a filament. 3. Part of the same, with root-like ramuli:—*magnified*.

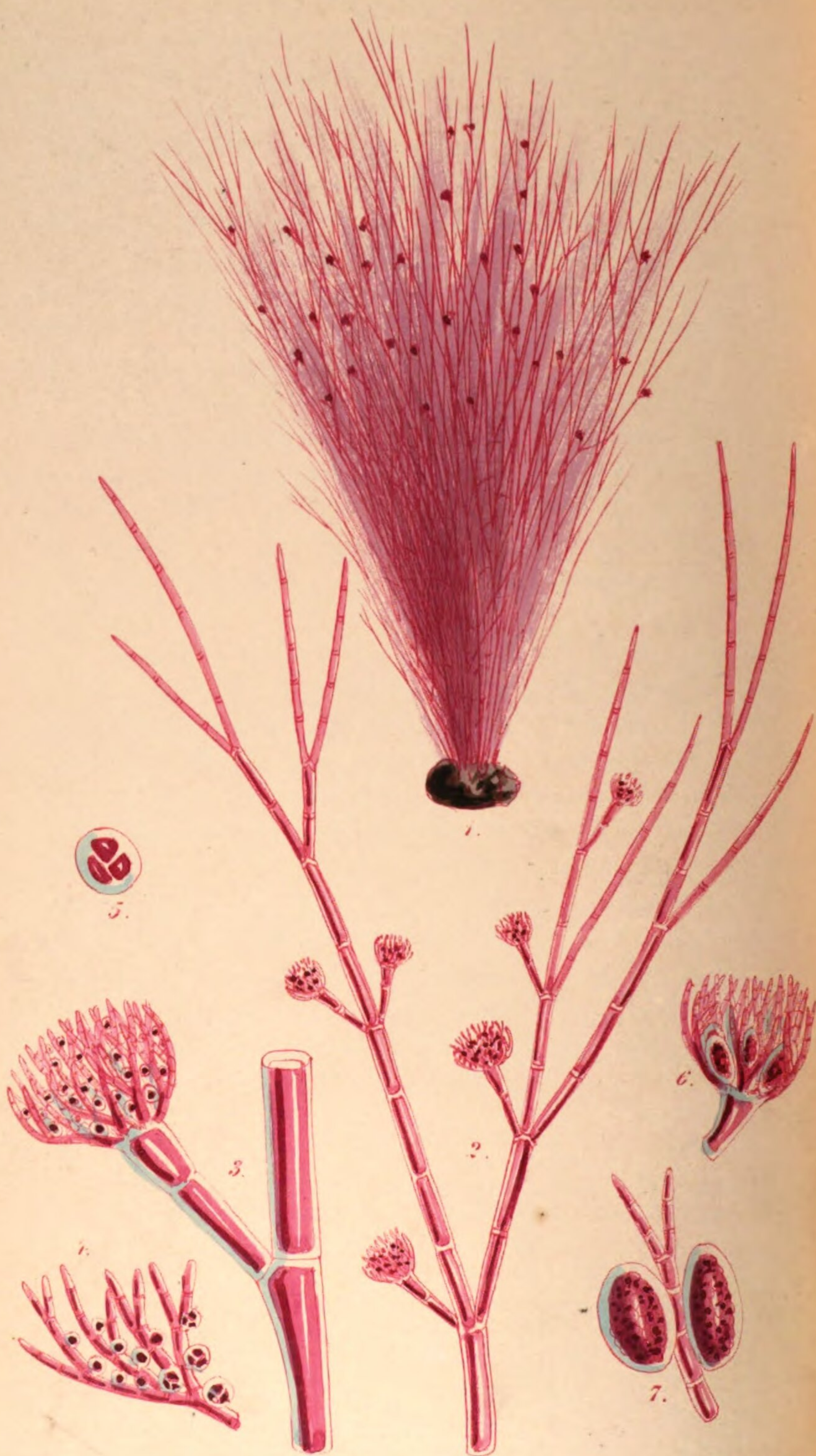


PLATE CLXXXIV.

GRIFFITHSIA SETACEA, *Ag.*

GEN. CHAR. *Fronde* rosy-red, filamentous; filaments jointed throughout, mostly dichotomous; ramuli single-tubed; dissepiments hyaline. *Fructification* of two kinds on distinct individuals; 1, *tetraspores* affixed to whorled involucrel ramuli; 2, gelatinous *receptacles* (*favellæ*) surrounded by an involucre, and containing a mass of minute, angular spores. GRIFFITHSIA (*Ag.*),—in honour of *Mrs. Griffiths*, the most distinguished of British Algologists.

GRIFFITHSIA *setacea*; filaments setaceous, straight, rigid, dichotomous, or subdichotomous; axils very acute; lesser branches sometimes opposite, attenuated to a point, erect; articulations cylindrical, five or six times longer than broad; involucrel (of both kinds) pedunculate, lateral.

GRIFFITHSIA *setacea*, *Ag. Syn.* p. xxviii. *Ag. Syst.* p. 144. *Ag. Sp. Alg.* vol. ii. p. 129. *Grev. Fl. Edin.* p. 312. *Hook. Br. Fl.* vol. ii. p. 338. *Harv. in Mack. Fl. Hib.* part 3. p. 212. *Wyatt, Alg. Danm.* no. 137. *Harv. Man.* p. 103. *Endl. 3rd Suppl.* p. 35. *Kütz. Phyc. Gen.* p. 373. *Hook. fil. Fl. Ant.* vol. i. p. 191.

CONFERVA *setacea*, *Ellis, Phil. Trans.* vol. 57. t. 18. f. e. *Turn. Linn. Tr.* vol. vii. p. 107. *Huds. Fl. Ang.* p. 599. *With.* vol. iv. p. 137. *E. Bot.* t. 1689. *Dillw. Conf.* t. 82. *Roth, Cat. Bot.* vol. iii. p. 278.

HAB. On the perpendicular sides of deep rock pools, near low-water mark, under the shade of larger Algæ. Perennial. Fruiting in spring and summer. Frequent on the British shores, from Orkney to Cornwall. Channel Islands.

GEOGR. DISTR. Atlantic shores of Europe and America. Southern Ocean, especially Tasmania.

DESCR. *Tufts* three to eight inches long, or more, dense, frequently interwoven in the lower part with tangled fibres. *Filaments* as thick as hog's bristle, sometimes not quite so thick, gradually attenuated from the base upwards, many times dichotomous at short intervals; the lesser divisions more irregular, alternate, or secund, frequently opposite; all the branches straight, and generally erect, with acute axils. Frequently small, root-like, irregular, horizontal ramuli issue from the sides of the main branches, and catching on a neighbouring branch, connect the filaments in a tangled web. Lesser branches gradually attenuated to the point. *Articulations* cylindrical; the lower ones five or six times as long as broad, or sometimes more; the upper gradually shorter, all containing bags of endochrome surrounded by a narrow border. *Involucrel* of both kinds raised on short, lateral peduncles, about a line in length, scattered on the sides of the branches, those containing tetraspores most frequently found. *Tetraspores* spherical, attached to the inner faces of the dichotomous, involucrel ramuli, with wide borders. *Favellæ* generally binate, oval, likewise attached to involucrel ramuli, on distinct plants. *Antheridia*, or minute oval bodies,

composed of dense whorls of exceedingly minute, glassy filaments, frequently occupy the place of tetraspores in the involucre. *Colour*, a fine transparent crimson, instantly discharged, with a crackling noise, in fresh water. *Substance* rather rigid and crisp, becoming flaccid after exposure to the air. In drying the plant adheres, but not very closely, to paper.

A long known and beautiful plant, found on all the British shores, and widely dispersed through the ocean; being found not only in the Atlantic, but in several parts of the Southern Pacific Ocean. From Van Dieman's Land I have seen very numerous specimens undistinguishable from British-grown ones.

When quite fresh, it is remarkably crisp and firm in substance, the points of its filaments standing firmly out, when the tuft is removed from the water. But it very rapidly becomes flaccid, and if dropped into fresh water, the membranous walls of its filaments burst asunder with violence, and with a sharp crackling noise, discharging the contents of the cells into the water. These form a fine powder of a brilliant carmine colour, and might, no doubt, be used as a pigment if the plant could be collected in sufficient quantity. Paper stained with this powder retains its brilliancy of colour in the Herbarium for many years. These remarks apply equally to other species of the genus.

I may add that, delicate as the structure of this plant assuredly is, no marine Alga is more patient of confinement, or may be more easily *domesticated*. A tuft placed in a closed bottle of sea water in April 1846, is now, after more than two years' imprisonment, apparently as fresh and healthy as when first taken from the sea. The water has not been changed, and is perfectly clear and pure. The plant has not grown much, as the bottle is a small one, but its threads reach nearly to the surface of the water; and no decay has taken place.

Fig. 1. GRIFFITHSIA SETACEA; tuft:—*of the natural size*. 2. Upper part of a fertile branch. 3. Involucre with *tetraspores*. 4. Ramulus from the same. 5. A tetraspore. 6. Involucre with *favellæ*. 7. Ramulus from the same:—*all more or less highly magnified*.

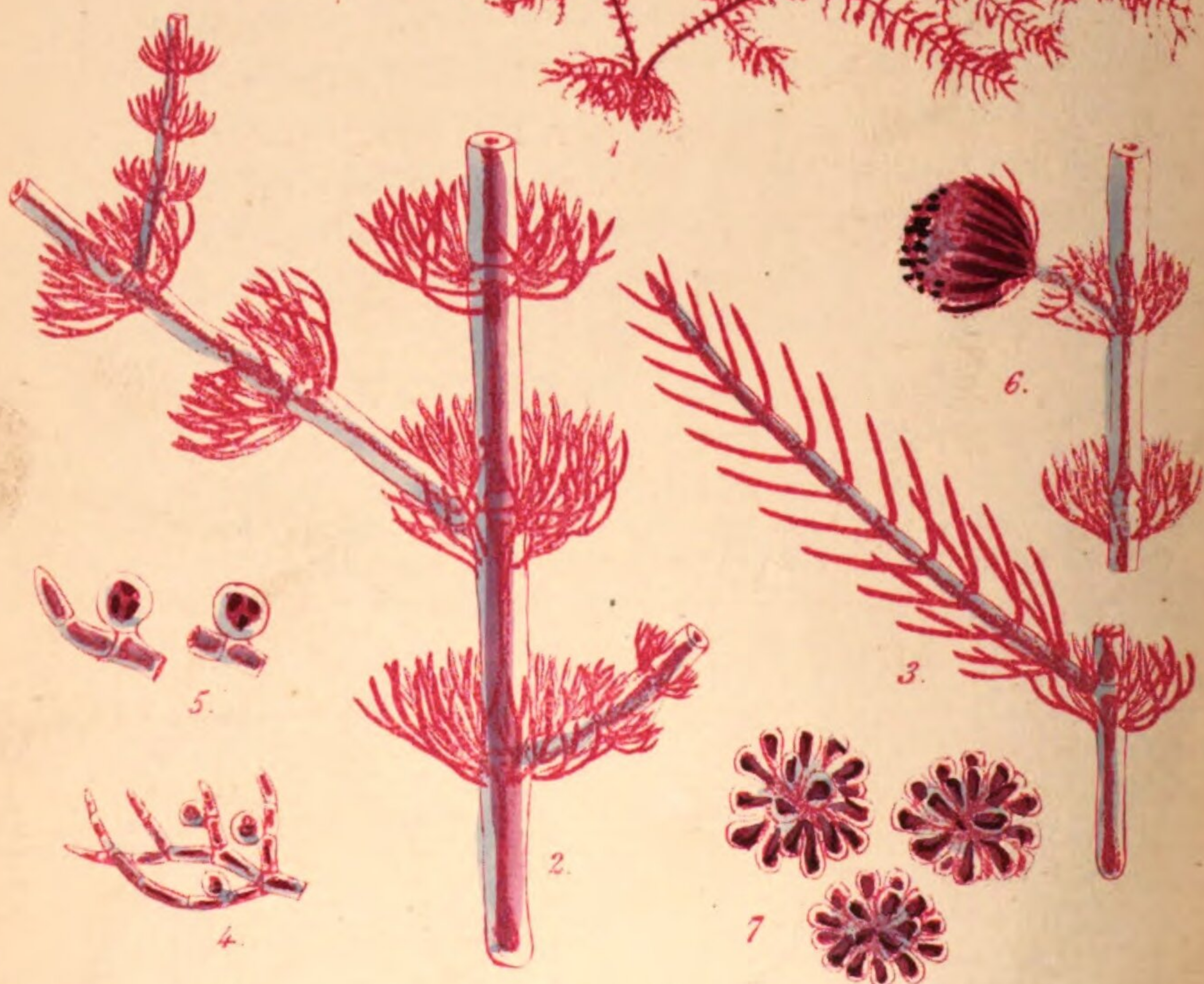
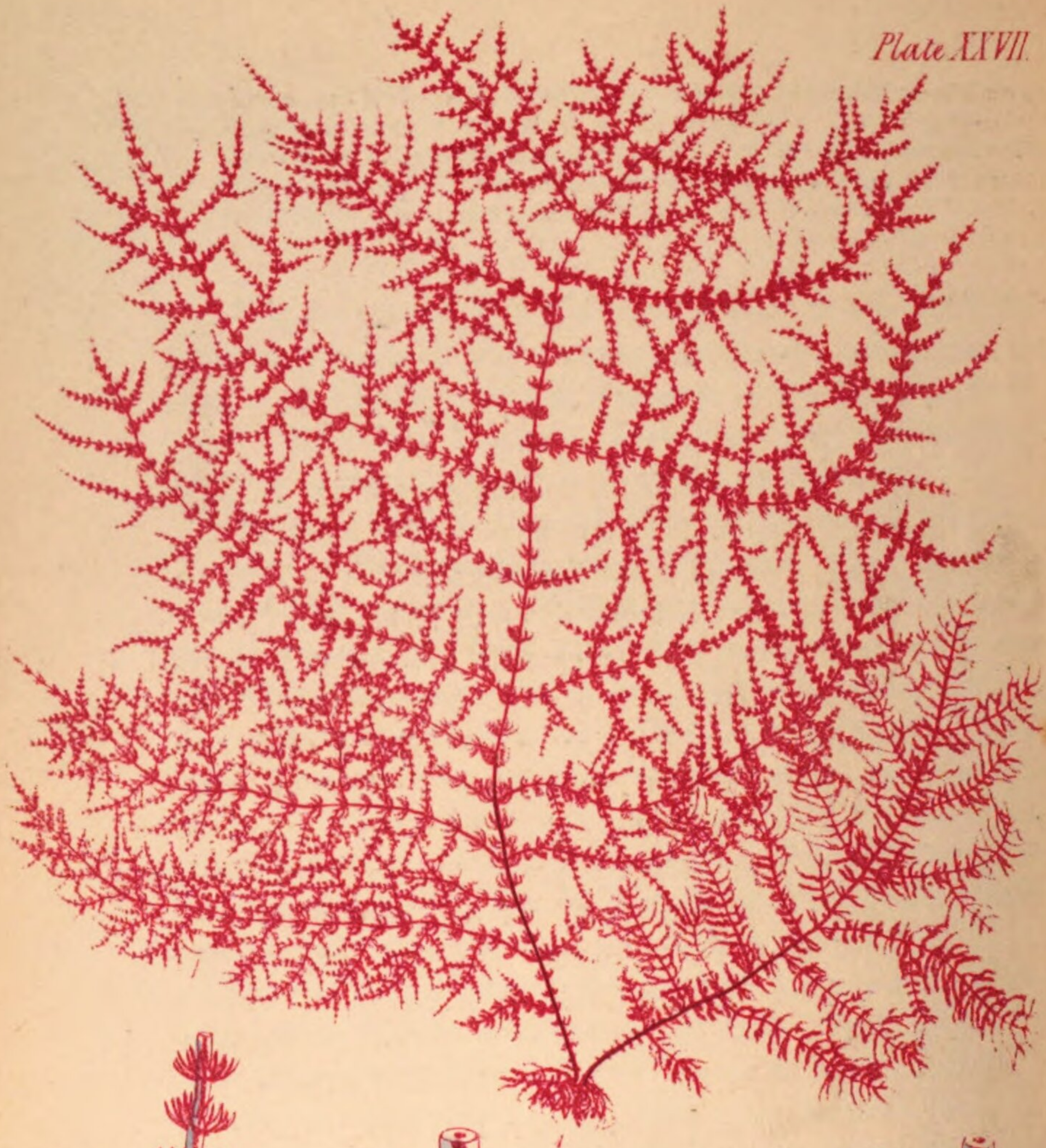


PLATE XXVII.

WRANGELIA MULTIFIDA, *J. Ag.*

GEN. CHAR. *Fronde* purplish or rose-red, filamentous, jointed; filaments single-tubed. *Fructification* of two kinds, on distinct individuals: 1, *tetraspores* affixed to the inner face of the ramuli (not confined to involucre); 2, gelatinous *receptacles* (*favellæ*) terminating the branches, surrounded by an involucre, and consisting of several clusters of pear-shaped spores, compacted together. WRANGELIA (*Ag.*)—in honour of Baron von Wrangel, a Swedish naturalist.

WRANGELIA *multifida*; stems setaceous, pinnate or bipinnate, articulated, each joint bearing a pair of opposite, slender, pinnato-multifid, incurved ramuli, or whorled with numerous sub-dichotomous ramuli; joints of the stem many times longer than broad.

WRANGELIA *multifida*, *J. Ag. Alg. Medit.* p. 79. *Endl. 3rd Suppl.* p. 35.

GRIFFITHSIA *multifida*, *Ag. Syst. Alg.* p. 143. *Ag. Sp. Alg.* vol. ii. p. 133. *Harv. in Hook. Br. Fl.* vol. ii. p. 338. *Harv. in Mack. Fl. Hib.* vol. iii. p. 212. *Harv. Man.* p. 102. *Wyatt. Alg. Danm.* No. 43. *McCalla, Alg. Hib.* No. 1.

CALLITHAMNION *multifidum*, *Kütz. Phyc. Gen.* p. 373.

CERAMIUM *verticillatum*, *Ducluz. sec. Ag.*

CERAMIUM *Casuarinæ*, *D.C. Fl. Gall. Syn.* p. 8.

CONFERVA *multifida*, *Hudson Fl. Ang.* 596. *Sm. E. Bot.* t. 1816. *Dillw. Conf. Syn.* p. 75.

Var. β , *pilifera*; ramuli very long, simple and hair-like.

GRIFFITHSIA *multifida* β . *pilifera*. *Ag. l. c.* *Harv. l. c.*

HAB. On the perpendicular sides of deep marine pools near low-water mark, under the shade of other Algæ. Frequent on the southern shores of England; and west of Ireland. Belfast Bay, *Mr. Thompson*. Jersey, *Miss White*, *Miss Turner*. Rare in Scotland? Saltcoats (floating), *Miss Margaret Landsborough*.

GEOGR. DISTR. Atlantic coasts of Europe. Rare in the Mediterranean sea.

DESCR. *Root* accompanied by irregularly branching fibres. *Filaments* 4–8 inches high, as thick as hogs' bristles, generally undivided, but furnished throughout their length with lateral, opposite or alternate spreading, distichous or spirally quadrifarious, simple branches similar to the stem; and like it bearing a second or even a third series, which gradually become more and more slender. *Stem* and *branches* jointed, the articulations very variable in length in different specimens, 5–10 times longer than broad, single tubed, with a very wide hyaline border, each bearing at a short distance below the joint either a pair of slender, opposite pinnato-multifid ramuli (which seems to be the normal state of young individuals), or, as shown in our figure,

numerous whorled, multifid incurved ramuli. The articulations of the ramuli are much shorter in proportion than those of the branches, being usually not more than twice or thrice as long as broad; the apices are obtuse. In var. β the ramuli are sometimes simple, and naked, half an inch long or more; sometimes (fig. 3) pinnated with opposite, simple ramelli. Colour a fine, transparent, rose-red, perishing quickly in the air or in fresh water. *Tetraspores* minute, roundish with wide borders, sessile on the lower part of the ramuli. *Favellæ* borne on short branches, surrounded by an involucre of multifid ramuli, berry-like, consisting of numerous distinct clusters of large pear-shaped spores, arranged in globose radiating tufts, densely compacted together. *Substance* at first crisp, soon becoming flaccid, and closely adhering to paper in drying.

The description given by Hudson of his *Conferva multifida*, though brief, is so characteristic of the present species that I cannot help agreeing in opinion with Smith, that this is really the plant he intended, although Mr. Dillwyn, who holds a contrary opinion, informs us that an authentic specimen of Hudson's plant, communicated by Dr. Goodenough to Mr. Dawson Turner, proved to be *Griffithsia equisetifolia*. Hudson describes his plant as "subgelatinous, much branched, with *opposite*, long branches; *opposite* multifid, short, slender ramuli, *remote* and as if whorled;" characters which agree well with *Wrangelia multifida*, whose *ramuli* are, I believe, always opposite and not whorled in the young plant; they are *remote*; and the branches are very frequently *opposite*. None of these characters coincide with *G. equisetifolia*.

The genus *Wrangelia*, to which, following the recent views of the younger Agardh, I remove this plant, was founded by Bishop Agardh on a Mediterranean species, which agrees in its fructification with our *W. multifida*, but which has an inarticulate, or rather an opaque, *internally* jointed stem. The structure of the *favellæ*, and the disposition of the *tetraspores* are different from what occur in *Griffithsia*, and the branching of the frond is more pinnate than dichotomous. Some fine species of *Wrangelia* are found in Tasmania and New Holland.

W. multifida, originally discovered on the south coast of England, seems to find its greatest perfection and beauty on the west coast of Ireland. Some of the Irish specimens would easily cover a quarto page.

Fig. 1. WRANGELIA MULTIFIDA :—*natural size*, 2. Portion of a branch. 3. The same, var. β . 4. Ramulus with tetraspores. 5. Tetraspores. 6. Portion of a branch, with a favella. 7. Clusters of spores from the favella.



PLATE XXI.

SEIROSPORA GRIFFITHSIANA, *Harv.*

GEN. CHAR. *Frond* rosy, filamentous; stem articulated, one-tubed, the articulations traversed by jointed filaments; *branches* jointed, one-tubed. *Fruit*: oval *tetraspores* disposed in terminal, moniliform strings. Favellæ?. SEIROSPORA—from *σειρά*, a *chain*, and *σπόρος*, a *seed*; chain-seed.

SEIROSPORA *Griffithsiana*.

CALLITHAMNION *seirospermum*, *Griff. in Harv. Man.* p. 113.

CALLITHAMNION *versicolor*, β . *seirospermum*, *Harv. in Hook. Journ. Bot.* vol. i. p. 302. *Harv. in Mack. Fl. Hib.* part 3. p. 216. *Wyatt, Alg. Danm.* no. 19.

HAB. On rocks and stones in the sea, in four to six fathoms water. Rare. Annual. Summer. At Torquay, *Mrs. Griffiths*. Salcombe, *Mrs. Wyatt*. Portaferry, *Mr. W. Thompson*. Arran, *Rev. D. Landsborough*.

GEOGR. DISTR. British Islands, rare. Sweden, *Areschoug*.

DESCR. *Root* a small disc. *Stems* solitary or slightly tufted, 1–3 inches high, setaceous, generally undivided, more or less opaque and veiny; the *veins*, which are internal, articulated fibres, originating at the insertion of the branches, and traversing the stem in a downward, root-like direction. *Branches* tetrastichous or sub-distichous, numerous, long, simple, alternate, patent, issuing along the length of the stem from a short distance above the base to the apex, closely set; the lowest longest, the upper gradually shorter; so that the general outline of the frond is triangular ovate. The larger branches often bear a second set of similar branches. All are more or less furnished with sub-dichotomous, multifid, level-topped ramuli, with a narrow-obovate outline, jointed, the joints 2–4 times longer than broad, somewhat swollen upwards. The *tetraspores* are elliptical, triangularly divided, arranged in beaded, dichotomous strings at the tips of the branches; that is to say, speaking morphologically, the articulations of the terminal ramuli are transformed into tetraspores. *Colour* a fine rosy red. *Substance* gelatinous, flaccid, and closely adhering to paper.

This beautiful plant was discovered by Mrs. Griffiths in the Autumn of 1833, and by that acute observer was at once pronounced to be a new species. I was not so confident of its claims to this distinction, and first described it as a variety of *Callithamnion versicolor*, chiefly remarkable for a curious modification of fruit. There is, indeed, a close resemblance to strong growing plants of *C. versicolor*, so close that we are driven to look

to the fructification for marks of difference. Here, however, the characters are so broadly defined, that if we regard the fruit of our *Seiropora* as being *normal*, according to the view first taken by Mrs. Griffiths and latterly though with some hesitation and reluctance adopted by me, we shall be compelled to form a new genus for its reception. In *Callithamnion* the tetraspores are borne laterally along the ramuli; here the ramuli themselves are converted at maturity into strings of tetraspores; a tetraspore being formed *within* each of the articulations of the ramulus. This character is quite as strong, in a generic view, as that which separates any other genus of *Ceramieæ*, and amply sufficient to distinguish the plant from *Callithamnion*.

Additional strength has certainly been latterly given to the view taken by Mrs. Griffiths, by the plant having been found in three new and widely separated habitats, namely, in Ireland, in Scotland, and in Sweden. I trust, therefore, that the species is well established.

The specimen here drawn is a remarkably fine one, which I owe to the kindness of Mrs. Wyatt who gathered it at Salcombe. Average specimens are not much more than half the size.

Fig. 1. SEIROSPORA GRIFFITHSIANA:—*natural size*. 2, Portion of a branch.
3. Portion of the main stem. 4. Ramulus with a cluster of tetraspores
5. Tetraspores removed:—*all highly magnified*.

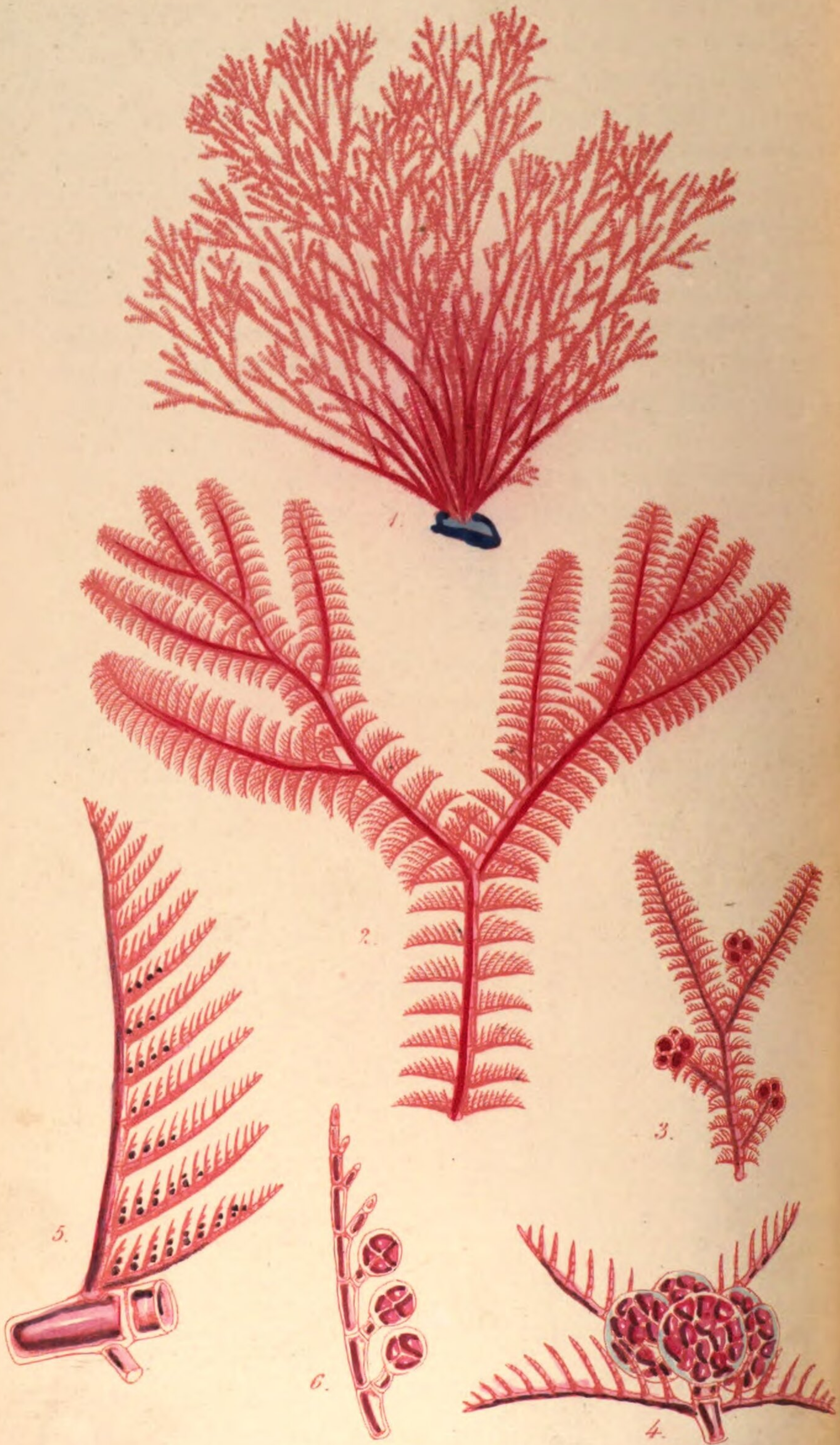


PLATE CCXLII.

CALLITHAMNION PLUMULA, *Lyngb.*

GEN. CHAR. *Frond* rosy or brownish red, filamentous, stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like *receptacles* (*favellæ*) seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλος*, *beautiful*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *Plumula*; stems distichously branched, subdichotomous, articulated; each articulation bearing a pair of short, recurved plumules, pectinated on their upper margin.

CALLITHAMNION *Plumula*, *Lyngb. Hyd. Dan.* p. 127. *Ag. Sp. Alg.* vol. ii. p. 159. *Harv. in Hook. Br. Fl.* vol. ii. p. 339. *Harv. in Mack. Fl. Hib.* part 3, p. 213. *Harv. Man.* p. 104. *Wyatt, Alg. Danm.* no. 138. *Endl. 3rd Suppl.* p. 34. *Hook. fil. Fl. Antarct.* vol. ii. p. 489. *J. Ag. Alg. Medit.* p. 71. *Kütz, Phyc. Gen.* p. 372.

CERAMIUM *Plumula*, *Ag. Syn.* p. 62. *Ag. Syst.* p. 142.

CONFERVA *Plumula*, *Ellis, Phil. Trans.* p. 57. t. 18. *Dillw.* t. 50.

CONFERVA *Turneri*, *Sm. E. Bot.* t. 1637 (not 2339).

HAB. On rocks and Algæ, near low-water mark, and in 4–15 fathoms water. Annual. Summer. Not uncommon, from Orkney to Cornwall.

GEOGR. DISTR. Atlantic shores of Europe and North America. Mediterranean Sea. Cape Horn, *Dr. Hooker*. Tasmania, *Gunn*.

DESCR. *Root*, a small disc. *Fronds* densely tufted, from two to six inches in length, capillary, flaccid, distichously branched, the branches alternate or subdichotomous, repeatedly divided. The stems are articulated to the base, and every articulation, of the main stems as well as of the branches and their divisions, bears a pair of opposite, minute ramuli or *plumules*, inserted a short way below the apex of the articulation, and very much more slender than the part from which they spring. In luxuriant specimens *four* plumules instead of two, are frequently found. These plumules are from half a line to a line in length, spreading horizontally or somewhat reflexed, and pectinated, or bi-tripectinated along their upper faces; the ramuli of the combs standing at an angle of 45° with the rachis. Every articulation of the rachis bears its ramulus, with great regularity. The *tetraspores* are borne on the tips of the ultimate ramuli; they are therefore pedicellate. The *favellæ* are densely clustered, and terminate the main branches, which are there always shortened. The *colour* is a fine carmine, sometimes brownish; and is well preserved in drying. The substance is soft and tender, and the plant closely adheres to paper.

A very charming plant, though a common one; common, not merely on the shores of Europe, but dispersed far and wide through the ocean, north and south of the Line. Dr. Hooker gathered it at Cape Horn, and Mr. Gunn has sent it from Van Dieman's Land. I have examined specimens from these distant habitats, and compared them with those from our own shore, and can detect no specific distinctions. The characters of the species are indeed strongly marked, and once seen, cannot be forgotten. Would that others of this beautiful genus were equally constant! It would save botanists a world of trouble and uncertainty. Here every articulation, without exception, through the whole plant, bears its pair of comb-like branchlets. Under the microscope, therefore, *Cal. Plumula* cannot well be mistaken. But, notwithstanding this perfect regularity of branching, specimens differ much in luxuriance, and consequently in outer aspect; and we might enumerate *two* varieties, in one of which the combs are twice as long as in the other, and more delicate.

Cal. simile of the Antarctic Flora, a native of Kerguelen's Land, is an instance of a closely allied, and yet perfectly distinct species, and shows in a very forcible manner how similar two things in nature may be, without being the same; how closely she can draw her lines without touching at any point!

Fig. 1. CALLITHAMNION PLUMULA:—*of the natural size.* 2. Portion of a frond. 3. Portion of another specimen, with *favellæ*. 4. *Favellæ*, with surrounding plumules. 5. Plumule, bearing *tetraspores* on its ultimate ramuli. 6. Penultimate ramulus from the same, with tetraspores:—*all more or less highly magnified.*



PLATE CLXIV.

CALLITHAMNION CRUCIATUM, *Ag.*

GEN. CHAR. *Fronde* rosy, or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate, (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλος*, *beautiful*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *cruciatum*; filaments densely tufted, irregularly and rather sparingly branched; branches alternately divided, jointed, furnished at each joint with two to four opposite or quaternate, slender, short pectinato-pinnate ramuli; tetraspores elliptical, subsessile, borne on the lowermost joints of the ramuli.

CALLITHAMNION *cruciatum*, *Ag. Syst. Alg.* vol. ii. p. 160. *Harv. in Hook. Br. Fl.* vol. ii. p. 339. *Wyatt, Alg. Danm.* no. 182. *Harv. Man.* p. 104. *J. Ag. Alg. Medit.* p. 70. *Endl. 3rd Suppl.* p. 34. *Hook. fil. et Harv. in Lond. Journ.* vol. vi. p. 412.

β *pumilum*; much smaller, the ramuli more dense, and the joints shorter.

CALLITHAMNION *cruciatum*, β *pumilum*, *Harv. Man.* p. 104.

CALLITHAMNION *pumilum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 339. *Endl. 3rd Suppl.* p. 34. *Harv. in Mack. Fl. Hib.* part 3. p. 213.

HAB. On mud-covered rocks, near low water mark. Annual. Summer. Rather rare. Pier, Torquay, *Mrs. Griffiths*. Salcombe, *Mrs. Wyatt*. Milford Haven, *Mr. Ralfs*. Plymouth, *Rev. W. S. Hore*. Cork Harbour, *Dr. J. R. Harvey*. Coast of Down, *Mr. W. Thompson*. Ferriter's Cove, Kerry, *Mr. W. Andrews*. β, Miltown Malbay, *W.H.H.*

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean and Adriatic Seas. Tasmania, *Mr. Gunn*.

DESCR. *Filaments* one to two inches long, capillary, flaccid, densely tufted, sparingly branched in an irregular manner. *Branches* mostly alternately divided, the lesser divisions furnished with short lateral branchlets, jointed; each joint throughout the whole length of the plant furnished with slender opposite or quaternate and cruciate ramuli. *Ramuli* not more than half the diameter of the branches, from half a line to nearly a line long, erecto-patent, straight, pectinato-pinnate; the pinnulæ opposite, very slender, cylindrical, not greatly tapering to the point. *Apices* of the branches darkened, owing to the crowding of the terminal ramuli. *Articulations* of the stem and branches from two to four times as long as broad; of the ramuli twice or thrice; and of the pinnulæ about twice as long as broad: the dissepiments somewhat contracted. *Tetraspores* formed by the metamorphosis of the lowermost pinnulæ, sessile or subpedicellate, elliptical, cruciately divided, with a rather narrow limbus. *Favellæ* I have not seen. *Colour* a brownish-red. *Substance* flaccid. The plant adheres closely to paper, and is apt to decompose if wetted after once it has been dried.

A very distinct and beautiful species of this charming genus, and one which is very widely distributed. It was first noticed in the Mediterranean, from whence I have received excellent specimens. Mrs. Griffiths added it to the British Flora nearly twenty years ago; and it has since been found on several parts of the English and Irish coasts. More recently Mr. Gunn has sent specimens from Tasmania exactly similar to our European plant, thus proving that it exists in the temperate regions of the Southern, as well as of the Northern Hemisphere. It is not subject to much variation, except of a very minor character. The opposite or quaternate pinnulated ramuli constantly mark it. In some individuals the joints of the stem are much shorter, the ramuli more dense, and the whole plant very small. These, before I was well acquainted with the variations of *C. cruciatum*, I was disposed to regard as a distinct species, which I described under the name of *pumilum*, in the British Flora. A better acquaintance with the species has shown that this view cannot be maintained. I have specimens from Torquay showing every gradation between the original *pumilum* and the normal state of the plant; and I have others which vary in an opposite direction—the joints being very long, and the ramuli distant and either simple or with very few pinnulæ. Such specimens show an approach to the rare *C. floccosum*, though abundantly different from any state of that beautiful plant. An excellent mark for *C. cruciatum*, by which it may be known at a glance, lies in the very dense tufts terminating the branches, consisting of undeveloped ramuli.

Fig. 1. *CALLITHAMNION CRUCIATUM*; a tuft:—*of the natural size*. 2. Part of a branch, clothed with ramuli. 3. Portion, with fertile ramuli. 4. Tetraspores, *in situ*. 5. Uppermost pinnulæ:—*all more or less highly magnified*.



PLATE LXXXI.

CALLITHAMNION FLOCCOSUM, *Ag.*

GEN. CHAR. *Frond* rosy or brownish red, filamentous; *stem* either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*)—from *καλλίς*, *beautiful*, and *θαμνίον*, *a little shrub*.

CALLITHAMNION *floccosum*; frond capillary, very flaccid, remotely much branched; branches alternate, erecto-patent, articulated; every joint producing a pair of opposite, simple, subulate, erecto-patent, minute ramuli; tetraspores elliptical, pedicellate, produced on the ramuli, near their base.

CALLITHAMNION *floccosum*, *Ag. Sp. Alg.* vol. ii. p. 158. (*excl. Syn.* Dillw.) *Endl.* 3rd *Suppl.* p. 34.

CALLITHAMNION *plumula*, *Lyngb. Hyd. Dan.* p. 127. (*excl. var. β.*)

CALLITHAMNION *Pollexfenii*, *Harv. in Ann. Nat. Hist.* vol. xiv. p. 186. t. 5. f. 5—7.

CONFERVA *floccosa*, *Fl. Dan.* t. 828.

HAB. On submarine rocks, near low-water mark. Annual. Spring. Very rare. Orkney Islands, *Rev. J. H. Pollexfen*. Aberdeen. *Dr. Dickie*.

GEOGR. DISTR. Coast of Norway. North of Scotland.

DESCR. *Fronds* densely tufted, from one to four inches in length, capillary, very flaccid, irregularly divided into several principal branches, in an alternate or subdichotomous manner, the furcations rather distant; main branches either naked or furnished at intervals with short, closely branched or multifid lateral secondary branches, having an obovate outline; all the divisions alternate, the axils acute, and the branches and their secondaries erecto-patent or erect. *Filaments* pellucidly articulate throughout, the articulations from two to four times as long as broad, each having a pair of opposite, subulate, simple, minute ramuli, not half a line in length, springing from a short distance above the middle of the articulation. *Tetraspores* elliptical, borne on short, accessory processes of the ramuli, issuing either on the inner or outer face. *Favellæ* unknown in this country.

In the year 1840, I received, from the Rev. J. H. Pollexfen, a specimen of this plant, gathered by him, in the previous summer, in one of the bays of the Orkney Islands, and not finding it to agree with the specific character of any species published

by Agardh, I published it as new, in the 'Annals of Nat. History for 1844, under the name of *C. Pollexfenii*, as a just tribute to its acute discoverer. At that time I had no suspicion that it could be the *C. floccosum* of Agardh, because the character he gives "ramellis oppositis ascendenti-patentibus sursum pectinato-pinnatis, pinnis simpliciusculis," by no means answers to the present individual, and agrees very well with a common variety of *C. Plumula*. Forming my judgment on the words "*sursum pectinato-pinnatis*;" as well as on Agardh's reference to Dillwyn's Plate 50. f. A, and on the note appended to his description, "Hinc hæc icon semper nobis dubia fuit, usque dum Hookerus specimen *Confervæ Plumulæ*, Dillw. misit, quod omnia explicavit, et nobis persuasit, dua individua diversæ speciei picta esse;" I could not believe otherwise than that his *C. floccosum* was founded on a bad specimen of *C. Plumula*, for I knew that Sir W. J. Hooker could never have sent Agardh a specimen of my *C. Pollexfenii*, which did not exist in his Herbarium, until Dr. Dickie communicated it in 1844; and still less could it have been the plant intended by Dillwyn's figure. Were there no other grounds, therefore, for upholding Agardh's *C. floccosum*, than the description he has given of it, that species must be erased, and its synonymes transferred to *C. Plumula*. But the real foundation of *C. floccosum* rests, on the figure in 'Flora Danica,' and the description given by Lyngbye, in his excellent work, above quoted. My error consisted in having omitted to refer to that figure and description; for though the figure is not very accurate, yet it certainly is more characteristic of our plant than of *C. Plumula*; while the description given by Lyngbye, and which was taken from an authentic specimen of the plant figured in 'Flora Danica,' answers in all respects to my *C. Pollexfenii*. I am compelled, therefore, to restore the specific name, under which this species was first published.

C. floccosum would appear to be peculiarly a northern plant, confined, so far as we know, to the coasts of Norway, and the north of Scotland,—in both which countries it is of extreme rarity.

Fig. 1. *CALLITHAMNION FLOCCOSUM*;—*of the natural size.* 2. A branch:—*magnified.* 3. Portion of the same. 4. Ramuli with tetraspores. 5. A tetraspore:—*highly magnified.*

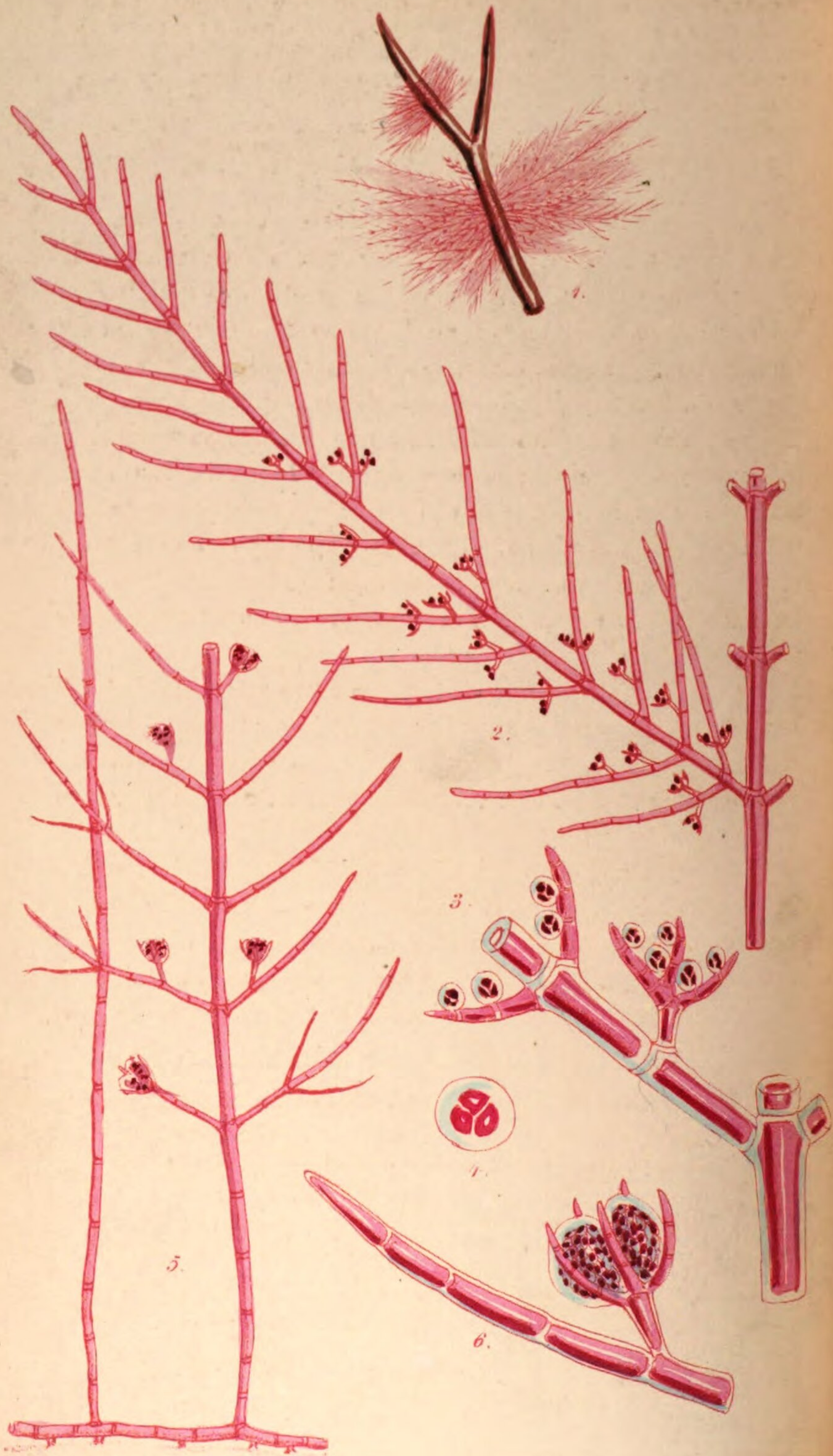


PLATE CLXXIX.

CALLITHAMNION TURNERI, *Ag.*

GEN. CHAR. *Frond* rosy, or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed, branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like *receptacles* (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*), from *καλος*, *beautiful*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *Turneri*; filaments rising from creeping fibres, simple or repeatedly branched, once or twice pinnated with opposite, spreading simple ramuli; articulations of the main filaments 5–10 times longer than broad; tetraspores clustered, subracemose or corymbose, favellæ involucreted, stalked.

CALLITHAMNION *Turneri*, *Ag. Syst. Alg.* vol. ii. p. 100. *Harv. in Hook. Br. Fl.* vol. ii. p. 339. *Wyatt, Alg. Danm.* no. 183. *Harv. in Mack. Fl. Hib.* part 3. p. 217. *Harv. Man.* p. 114. *J. Ag. Alg. Medit.* p. 70. *Endl. 3rd Suppl.* p. 34. *Kütz. Phyc. Gen.* p. 373.

CALLITHAMNION *repens*, *Lyngb. Hyd. Dan.* p. 128. t. 40. *Ag. Spec. Alg.* vol. ii. p. 184. *Harv. in Hook. Br. Fl.* vol. ii. p. 348. *Harv. in Mack. Fl. Hib.* part 3. p. 218. *Harv. Man.* p. 115. *Kütz. Phyc. Gen.* p. 372.

CALLITHAMNION *variabile*, *Ag. Sp. Alg.* vol. ii. p. 163? *Kütz. Phyc. Gen.* p. 372.

CERAMIUM *Turneri*, *Roth. Cat.* vol. iii. p. 128. t. 5. *Ag. Syst.* p. 142. *Grev. Crypt.* t. 355.

CERAMIUM *repens*, *Ag. Syn.* p. 63. *Ag. Syst.* p. 131.

CONFERRA *Turneri*, *Dillw.* t. 100. *E. Bot.* t. 2339 (*not* t. 1637).

CONFERRA *repens*, *Dillw.* t. 18. *Roth. Cat.* vol. iii. p. 221. *E. Bot.* t. 1608. *Fl. Dan.* t. 1665.

CONFERRA *tenella*, *Dillw. Syn.* p. 72. t. F.

HAB. Parasitical on other Algæ, between tide marks. Annual. Summer. Not uncommon.

GEOGR. DISTR. Atlantic shores of Europe and North America. Mediterranean Sea.

DESCR. *Filaments* rising from numerous prostrate fibres which creep, by means of small, discoid roots, over the surface of other plants, densely tufted, one to two inches high, capillary, simple or repeatedly branched; the branches very generally opposite, sometimes alternate, spreading, pinnated or bipinnated with simple, slender, elongated, patent, opposite, or rarely alternate ramuli. *Articulations* of the main stem from five to ten times longer than broad; those of the ramuli 4–5 times; all with a narrow endochrome, bordered by a wide hyaline coat. *Dissepiments* broad. *Tetraspores* globose,

with wide margins, sessile on the sides of short, simple, or branched peduncles, which rise from the ramuli near their base. *Favellæ* mostly bilobed, involucrate, borne on lateral peduncles, or terminating shortened ramuli. *Substance* flaccid, adhering to paper. *Colour* a fine rose red, soon fading in fresh water. Sometimes the ramuli are alternate, and then the plant becomes *C. repens* of authors.

This pretty little species of *Callithamnion* was named by Dr. Roth after its discoverer Mr. Dawson Turner, the celebrated author of the *Historia Fucorum* and numerous other learned works. It was first observed on the Norfolk coast; and has since been found on most of the shores of Europe, where it not uncommonly creeps over the fronds of various small Algæ.

After as careful study as I have been able to give the subject, I am persuaded that *Cal. repens* of authors is nothing more than an imperfectly developed state of this species, in which either the plant is in a very young state, or, if more fully grown, the branches are mostly alternate. I have examined numerous specimens in which the alternate and opposite branching occurs in different parts of the same specimens; and as this is the chief character insisted on by those who contend for two species, its failure must destroy one of them. The form which has been called *C. Turneri* exhibits the species in its most perfect state, and therefore this name, apart from its commemorative significancy, deserves to be retained.

The fructification of this species differs in some respects from that of other *Callithamnion*, and shows an approach to *Griffithsia*, especially in the involucreted favellæ. The tetraspores are, however, not so regularly disposed as in that genus; and the habit is much more like that of *Callithamnion*.

Fig. 1. *CALLITHAMNION TURNERI*:—*of the natural size.* 2. Branch with tetraspores. 3. Portion of the same. 4. A tetraspore. 5. Portion of a filament with favellæ. 6. Ramulus and pedunculate favella.



PLATE CLXV.

CALLITHAMNION BARBATUM, *Ag.*

GEN. CHAR. *Fronde* rosy or brownish red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*), —from *καλος*, *beautiful*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *barbatum*; stems (rising from creeping filaments?) much and irregularly branched; branches mostly alternate, long, subsimple, naked, or pinnulated with minute, opposite, spine-like, erecto-patent ramuli; articulations twice or thrice as long as broad; tetraspores elliptic oblong, with a wide limbus, sessile on the sides of the pinnulæ.

CALLITHAMNION *barbatum*, *Ag. Syst. Alg.* vol. ii. p. 181. *Harv. Man.* p. 114. *J. Ag. Alg. Medit.* p. 70. *Endl. 3rd Suppl.* p. 34. *E. Bot. Suppl.* t. 2889.

CALLITHAMNION *Ralfsii*, *Harv. in Herb.* (1838.)

HAB. On mud-covered rocks, in the sea, between tide-marks. Very rare. Perennial? Ilfracombe, and on the quay at Penzance, *Mr. Ralfs.* (1838.) Dredged at Weymouth, *Rev. M. J. Berkeley.*

GEOGR. DISTR. Mediterranean Sea.

DESCR. *Filaments* forming intricate tufts, densely matted together and apparently connected at base by creeping fibres, but difficult to disentangle; one to two inches high, much and irregularly branched; branches alternate or opposite, erect, long, simple, or bearing others similar to themselves, their upper half closely pinnulated with very short, opposite, spine-like, erecto-patent ramuli, their lower part either naked or irregularly pinnulated with similar ramuli. *Articulations* cylindrical, twice or thrice as long as broad. *Tetraspores* elliptic-oblong, with a very wide limbus, borne on the sides of the ramuli, sessile, mostly solitary. *Favellæ* unknown. *Substance* membranaceous and somewhat rigid, imperfectly adhering to paper. *Colour* a dull brownish-red, without gloss.

To the naked eye, this species, unless closely examined, resembles a ragged specimen of *C. floridulum*, though when compared under a lens with that plant the two are seen to be abundantly different. The short opposite ramuli which feather the ends of the branches of *C. barbatum*, and which are most abundant in summer specimens, though perhaps always to be

found in degree, form the striking mark of the species. Yet these ramuli are not noticed by Agardh in the description which he has given, in his *Species Algarum*. It would, therefore, be very questionable whether our plant and his were identical had not Mr. J. G. Agardh seen and examined specimens of the British plant, and pronounced them to be similar to those described by his father. But for this evidence, which I suppose is conclusive, I should have regarded the plant now described as a novelty; and, indeed, until the specimens had been submitted to Mr. Agardh, I did so regard it, and had intended to dedicate it to its estimable discoverer in this country, by the name *C. Ralfsii*. Should future observations prove that the plant of the elder Agardh is really different (as I suspect may be the case) I hope that the name *Ralfsii* may be retained for our British plant. I have seen no specimens but those gathered by Mr. Ralfs in 1838; nor have I heard of the species having been met with by any one else, except Mr. Berkeley, on the British coast.

Fig. 1. CALLITHAMNION barbatum; tuft:—*of the natural size*. 2. Portion of a filament. 3. Apex of a branch, with tetraspores. 4. Ramulus and tetraspores:—*all more or less highly magnified*.



PLATE CCXCVI.

CALLITHAMNION PLUMA, *Ag.*

GEN. CHAR. *Fronde* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores* scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish, or lobed, berry-like *receptacles* (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from *καλλος*, *beauty*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *Pluma*; stems rising from creeping filaments, erect, subsimple, or alternately branched; branches naked below, the upper half pinnated with short, erect, closely set, opposite ramuli; articulations from two to four times as long as broad; tetraspores globose, either terminating shortened pinnules, or placed on little stalks near the base of the pinnule.

CALLITHAMNION *Pluma*, *Ag. Sp. Alg.* vol. ii. p. 162. *Harv. in Hook. Br. Fl.* vol. ii. p. 340. *Harv. in Mack. Fl. Hib.* part 3. p. 217. *Harv. Man.* ed. 2. p. 173. *E. Bot. Suppl.* t. 2894. *Endl. 3rd Suppl.* p. 34. *Kütz. Sp. Alg.* p. 647.

CALLITHAMNION *Plumula*, β *pusillum*, *Lyngb. Hyd. Dan.* p. 127. t. 39.

CERAMIUM *Pluma*, *Ag. Syst.* p. 132.

CONFERVA *Pluma*, *Dillw. Conf.* p. 119. tab. F.

HAB. Parasitical on the stems of *Laminaria digitata*, rather rare. Annual. Summer. Bantry Bay, *Miss Hutchins.* Malbay, *W. H. H.* Appin, *Capt. Carmichael.* Probably overlooked on other parts of the coast.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. Forming velvety patches of some extent on the surface over which it spreads. *Fronde*s rising from prostrate, creeping filaments, erect, from a quarter to half an inch or rather more in height, very slender, simple, or furnished with alternate or opposite, very erect branches: sometimes, in luxuriant specimens, almost bushy. *Branches* naked in their lower half, closely feathered above with opposite, erect, simple, straight ramuli, a pair of which issue from every articulation of the branch: ramuli, from suppression, sometimes alternate or secund. *Articulations* of the stem from three to four times longer than broad, of the branches shorter; those of the ramuli frequently scarcely exceeding their diameter in length. *Tetraspores* globose, either borne on short, proper pedicels, which rise, singly or in pairs, near the base of the pinnules, or terminating a shortened pinnule:

in the former case each tetraspore is usually accompanied by a short unaltered cell or subtending ramulus. *Colour*, a fine, clear, crimson lake. *Substance* membranaceous, adhering to paper.

A beautiful little parasite, discovered originally by the late Miss Hutchins on the shores of Bantry Bay, and since detected in many distant points of the coast of Europe. It seems to be pretty much confined to the stems of *Laminaria digitata*, which it sometimes clothes in patches, looking like shreds of crimson velvet. Dillwyn's figure represents the upright stem as perfectly simple, the whole plant strictly resembling a little feather. I have sometimes met it so, but it is more usual to find one or two branches rising from the lower part, as shown in our figure. Among Capt. Carmichael's MSS. is a figure showing a much more compound state of this plant noticed by him on the west of Scotland, and this figure closely agrees with the description given by Lyngbye and Agardh of the species as it occurs in the north of Europe. *C. Pluma* is nearly allied to *C. Turneri*, from which it chiefly differs in the smaller size and shorter articulations, and in having the lower part of the stem and branches constantly naked.

Fig. 1. Patch of CALLITHAMNION PLUMA growing on the stem of *Laminaria digitata* :—*the natural size*. 2. Fronds from the same :—*magnified*. 3. Ramulus, with a *tetraspore*. 4. Apex of a young frond :—*both highly magnified*.



PLATE CCLXXIV.

CALLITHAMNION ARBUSCULA, *Lyngb.*

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*), from *καλλος*, *beauty*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *arbuscula*; stems naked below, inarticulate, robust, cartilaginous, the main divisions set with shorter branches, which are densely clothed on all sides with minute, imbricated, pinnated ramuli (plumules); ultimate pinnules simple or forked, recurved, acute, articulated, the articulations twice as long as broad; tetraspores globose, numerous, sessile on the upper edge of the pinnules.

CALLITHAMNION *arbuscula*, *Lyngb. Hyd. Dan.* p. 123. t. 38. *Harv. in Hook. Br. Fl.* vol. ii. p. 340. *Harv. in Mack. Fl. Hib.* part 3. p. 213. *Harv. Man.* ed. 1. p. 105.

PHLEBOTHAMNION *arbuscula*, *Kütz. Sp. Alg.* p. 656.

DASYA *spongiosa*, *Ag. Sp. Alg.* vol. ii. p. 121.

CONFERVA *arbuscula*, *R. Br.* — *Dillw.* t. 85. (excl. t. G.) *E. Bot.* t. 1916.

HAB. On rocks and mussel-shells, near low-water mark, usually in places left bare on the recess of the tide; also in tide-pools. Perennial. Summer and autumn. Abundant on the western shores of Scotland and Ireland; rare on the eastern. Frith of Forth, *Drs. Greville* and *Arnott*. Aberdeen, common, *Dr. Dickie*. Orkney, *Rev. J. H. Pollexfen*.

GEOGR. DISTR. The Ferroe Islands (and probably elsewhere in the Northern Sea).

DESCR. *Root* a fleshy, conical disc. *Fronds* several from the same base, from two to five or six inches high, as thick as small twine below, attenuated upwards, opaque, and without visible articulation, much branched and shrub-like. *Stems* naked below, densely set with lateral branches above, and these furnished with other smaller ones, spreading on all sides and making a bushy or shrub-like head. The lesser branches, which are from a quarter to half an inch in length, are densely clothed with minute, closely imbricated plumules, a line or two in length, which make each little branch cylindrical, and, being very dense towards the tips, give the apices of the branches a strikingly blunt, corymbose aspect. The plumules have a flexuous rachis, set with alternate, simple, or once forked, horizontally patent or reflexed pinnules. *Favellæ* of small size, binate or clustered, springing from the rachis of the plumules. *Tetraspores* sessile, spherical, of small

size, plentifully borne along the upper or inner edge of the ramuli, a tetraspore usually springing from every articulation. *Substance* in the stem and branches cartilaginous, flaccid in the ramuli. *Colour* a dark vinous red, inclining to purple, or sometimes to brown; staining fresh water carmine. Under the microscope the colour of the ramuli is a clear crimson lake.

The most robust and bushy of all the British *Callithamnion*, and therefore well named *Arbuscula*. The main stem is often upwards of a line in diameter, and divided into several stout branches, densely clothed with finely divided ramuli. The colour is always very dark, varying from brownish to a more or less vivid vinous purple. No species can well be confounded with the present, except, perhaps, very luxuriant specimens of *C. spongiosum*, but the microscopic characters of that species are extremely different. Formerly *Cal. arbuscula* was confounded with *Dasya arbuscula*, a mistake which could only arise from a very hasty examination of very imperfect specimens, for independently of generic character the plants are very different. In the *Dasya* the ramuli are dichotomous, and here they are pinnated, and far more densely crowded.

C. arbuscula is extremely abundant on the western coasts of Ireland and Scotland, and has been found on several parts of the east of Scotland; but is unknown in the east and south of Ireland, and has not, that I am aware of, been found in England. It delights on the most exposed rocks and the roughest water, and very commonly grows on the shells of *Mytilus rugosus*, in places where it is left dry for some hours each tide.

Fig. 1. CALLITHAMNION ARBUSCULA, growing on *Mytilus rugosus*:—the natural size. 2. Lesser branch clothed with plumules. 3. Segment of a small branch. 4. Plumule with tetraspores. 5. A ramulus and tetraspores from the same. 6. Plumule with favellæ. 7. Favellæ from the same:—all magnified.



PLATE CXXIX.

CALLITHAMNION BRODIÆI, *Harv.*

GEN. CHAR. *Fronde* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from *κάλλις*, *beautiful*, and *θαμνίον*, *a little shrub*.

CALLITHAMNION *Brodiaei*; stem sub-opaque, veiny, obscurely jointed, slender, simple, furnished throughout with densely inserted, patent, lateral branches; branches furnished at each joint, with short, quadrifarious, secondary-branches with a narrow hastate outline; plumules alternate, subsimple, pinnate, ovate, their pinnules patent, frequently with a few secund processes near the apex; tetraspores oval, sessile near the tips of the pinnules, or on their accessory processes; favellæ bilobed, on the secondary branches.

CALLITHAMNION *Brodiaei*, *Harv. in Hook. Br. Fl.* vol. ii. p. 105. *Harv. Man.* p. 105. *Wyatt, Alg. Danm.* no. 184.

HAB. Parasitical on Algæ, near low-water mark. Annual. Summer. Rare. *Forres, Mr. Brodie.* Coast of Northumberland, *Mr. Robertson.* Torquay, *Mrs. Griffiths* and *Miss Cutler.* Cornwall, *Mr. Ralfs.*

GEOGR. DISTR. British Islands.

DESCR. *Root* disciform. *Fronde* tufted, from one to three inches high, with a conical outline. *Stem* mostly simple, as thick as hog's bristle, smooth, or in old specimens slightly shaggy, opaque below, more or less evidently jointed above, the joints full of longitudinal veins, furnished throughout their length with very closely set, lateral, quadrifarious, patent branches, the lowermost of which are longest, the rest gradually shorter upwards. *Branches* more or less evidently jointed, the joints twice or thrice as long as broad, and full of veins, simple, like the stem, and like it densely clothed with a second, and in luxuriant specimens, a third series of lesser branches, gradually decreasing in size, but of a similar character. These secondary branches have a very narrow hastate outline, and are plumulate at every joint, the plumules somewhat spirally alternate, gradually diminishing in size and composition from the base to the apex. *Plumules* small, ovate, pinnate, sessile, with a flexuous rachis; their pinnules simple, patent, or erecto-patent, often furnished with a few secund processes towards the apex; apices sub-acute. *Joints* of the plumules once and a half to twice as long as broad. *Tetraspores* oval, sessile, one or two together, on the processes of the pinnules. *Favellæ* generally two-lobed, large, irregularly bursting out of the sides of the lesser branches, which are then frequently distorted. *Colour* brownish-red. *Substance* cartilagineo-membranaceous,

rather firm, adhering, but not very closely, to paper, and without gloss when dry.

This pretty species appears to have been first found, nearly half a century ago, by the late Mr. Brodie of Brodie, whose name it deservedly bears. Mr. Brodie, indeed, considered it identical with the *Conferva purpurascens* of Hudson: a doubtful synonyme, referred by Agardh to his *Cal. versicolor*, and applied by Sir James E. Smith ('E. Bot.' t. 2465.) to a plant found on the beach at Brighton by Mr. Borrer, which, to judge by the figure, has most of the characters of *C. roseum*. Hudson's brief description is insufficient, in the absence of authentic specimens, to ascertain the plant he had in view, and, therefore, when describing the present species in the 'British Flora' I assigned to it a new name.

Cal. Brodiaei has much the habit of a small specimen of *C. tetragonum*; the conical outline, undivided shrubby stem and lateral branches, are common to both. But the microscopic characters show a much nearer affinity with *C. Hookeri*, to some varieties of which it make a very near approach. In the individuals producing *tetraspores*, which are always more slender, and more regularly branched than those which bear *favellæ*, the pinules are pretty constantly furnished with short, secund ramuli in their upper half. In *C. Hookeri* such ramuli are either absent or are alternate, and more patent. In the length of the joints there is not much difference, and both species have sub-opake stems, traversed by densely packed articulated veins. I have not received any specimens of *C. Brodiaei* from the continent, nor am I aware that it has been found out of Britain.

Fig. 1. CALLITHAMNION BRODIAEI:—of the natural size. 2. Portion of a branch, with secondary branches. 2. A plumule. 4. Tetraspores, *in situ*. 5. Branchlet with a *favella*. 6. A portion of one of the main branches, showing the veins:—all more or less highly magnified.



PLATE CXXXVI.

CALLITHAMNION TETRAGONUM, *Ag.*

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from *καλλίς*, *beautiful*, and *θαμνίον*, *a little shrub*.

CALLITHAMNION *tetragonum*; outline of the frond ovate; stem cartilaginous, sub-simple, setaceous, somewhat opaque, veiny, set with subquadrifarious lateral branches, furnished sometimes with a second or third series; penultimate branches pellucidly jointed, slender, elongate, set with short, alternate, patent, level-topped plumules, the lowest of which are simply pinnate, the upper sub-bi-pinnate; ramuli incurved, narrowed at the base, suddenly acuminate, their articulations once and a half as long as broad, constricted at the joints; tetraspores exceedingly minute, oval, near the tips of the ramuli.

CALLITHAMNION *tetragonum*, *Ag. Sp. Alg.* vol. ii. p. 176. *Harv. in Hook. Br. Fl.* vol. ii. p. 343. *Harv. in Mack. Fl. Hib.* part 3. p. 215. *Harv. Man.* p. 108. *Wyatt, Alg. Danm.* no. 90. *J. Ag. Alg. Medit.* p. 74. *Endl. 3rd Suppl.* p. 34.

CERAMIUM *tetragonum*, *Ag. Syst.* p. 137.

CONFERVA *tetragona*, *With.* vol. v. p. 405. *Dillw. Conf.* t. 65. *E. Bot.* t. 1690.

HAB. Parasitical on the larger Algæ; commonly on the fronds of *Laminaria digitata*. Annual. Summer. Shores of England and Ireland.

GEOGR. DISTR. Atlantic shores of Europe. Baltic and Mediterranean Seas.

DESCR. *Root* scutate. *Fronds* from two to five inches in length, with a broadly ovate general outline. *Stems* thicker than hog's bristle, smooth, or clothed with short hair-like ramelli, jointed, but more or less opaque from the veins which traverse the articulations, subsimple, furnished throughout with numerous lateral patent, alternate, subquadrifarious, simple branches, the lowermost of which are longest. These *branches* are similar to the main stem, and bear a second or third series of lesser branches, all of which are perfectly simple. The penultimate branches are about half an inch long, pellucidly jointed, and clothed with very short plumules, set alternately. *Plumules* not half a line in length, the lowermost sub-simple or pinnate, the upper gradually more compound. *Ramuli* incurved, robust, thickest in the middle, suddenly acuminate at the point. *Articulations* of the stem and branches from two to three, or rarely four times as long as broad; those of the ramuli pretty constantly once and a half as long as their breadth. *Tetraspores* very minute, oval or oblong, sometimes transversely zoned, usually tripartite, borne near the tips of the ramuli, one or two on each ramulus.

Favellæ bi-lobed, large, formed from truncated plumules. Colour a brownish-red, becoming orange in fresh water, and darker in drying. Substance between cartilaginous and membranaceous, adhering, but not very closely, to paper in drying.

Callithamnion tetragonum, when fully grown, is one of the largest and most robust and shrubby of the British species of this charming genus, and, seen under water, is an object of much beauty. In drying, though it sufficiently retains its form, it loses considerably in elegance, from the pressing together of the delicate quadrifarious ramuli, which in a state of nature stand out from the branchlets, giving to the different parts of the frond a roundness, without confusion, or matting together of the minutest part. These, in dried specimens, become confounded together. Its most frequent habitat is on the stems and margins of the laciniae of *Laminaria digitata*, which it frequently fringes in the most beautiful manner; but it is by no means confined to this species, being often seen on some of the smaller Algæ, as on *Codium tomentosum*, *Chondrus crispus* and others. It rapidly changes colour in fresh water, assuming a brilliant orange tint, and giving out a rose-coloured powder. Though a species of large size, its *tetraspores* are exceedingly small, much smaller in proportion than those of most other species, and, being borne near the tips of the smaller and more crowded ramuli may easily escape detection. The *favellæ*, on the contrary, are of large size, and easily seen.

C. tetragonum appears to be of common occurrence on the shores of Europe, and very probably extends to the opposite side of the Atlantic. It is very closely, perhaps too closely, allied to *C. brachiatum*, Bonnem., which I have, therefore, figured on the following plate, that the distinctions may be more readily seen.

Fig. 1. *CALLITHAMNION TETRAGONUM*:—*the natural size*. 2. Penultimate branch, set with plumules. 3. A plumule, bearing tetraspores. 4. Ramulus from the same. 5. A plumule bearing favellæ. 6. Joints of one of the main branches, to show the veining:—*all more or less magnified*.



PLATE CXXXVII.

CALLITHAMNION BRACHIATUM, *Bonnem.*

GEN. CHAR. *Fronde* rosy, or brownish-red, filamentous; *stem* either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants: 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλῆς*, *beautiful*, and *θάμνιον*, a *little shrub*.

CALLITHAMNION *brachiatum*; outline of the frond lanceolate; stem cartilaginous, subsimple, setaceous, somewhat opaque, veiny, set with subquadrifarious, lateral branches, often furnished with a second series; penultimate branches pellucidly jointed, slender, elongate, set with short, alternate, very erect, level-topped plumules, the lowermost of which are most simple; ramuli erect, subulate, not narrowed at base, gradually tapering to a fine point, their articulations twice as long as broad, cylindrical; tetraspores minute, oval, near the tips of the ramuli.

CALLITHAMNION *brachiatum*, *Bonnem.* (sec. *Lenorm. in Herb.*)

CALLITHAMNION *Harveyanum*, *J. Ag. in Linn.* xv. p. 45. *Endl.* 3rd *Suppl.* p. 34.

CALLITHAMNION *granulatum*, *Harv. in Br. Fl.* vol. ii. p. 334 (not of *Agardh*). *Harv. in Mack. Fl. Hib.* part 3. p. 215.

HAB. Parasitical on the larger Algæ, frequently on *Laminaria digitata*, *Codium tomentosum*, &c. Staffa, *Capt. Carmichael*. Orkney, *Rev. J. H. Pollexfen*; *Messrs. Thomas and M'c Bain*. Torbay and Ilfracombe, *Mrs. Griffiths*. West of Ireland, *W.H.H.* Jersey, *Miss Turner*. Probably general, but frequently confounded with *C. tetragonum*.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Root* scutate. *Fronde* densely tufted, from two to four inches long, with a lanceolate general outline. *Stems* simple, distinctly jointed throughout but veiny, smooth, furnished from the base with numerous closely-set, alternate, subquadrifarious, erecto-patent lateral branches, of which those toward the middle of the stem are longest, the upper ones gradually decreasing. These are commonly simple, but in larger specimens bear a second series of lesser branches. Penultimate branches from a quarter to half an inch long, erecto-patent, subquadrifarious, set with alternate, very erect plumules in their upper part, below with simple or once forked subulate ramuli; plumules subsimply pinnate, level-topped, their pinnules very erect, subulate, not narrowed at base, perfectly cylindrical and gradually tapering to a fine point, somewhat incurved. *Tetraspores* small, elliptical, borne on the uppermost pinnules, near their tips. *Favellæ* simple, or bilobed, at the apices of shortened plumules. *Articulations* of the main stem from twice to thrice or four times as long as broad; of the ramuli about

twice as long as broad. *Colour* a brownish-red, purplish when dry. *Substance* between cartilaginous and membranaceous, adhering to paper.

I here figure a plant which in the 'British Flora' I had incorrectly referred to *C. granulatum*, Ag., a species which I now know to be much more nearly allied to our *C. spongiosum*. In the 'Manual', I have been content to regard the present as merely a slender variety of *C. tetragonum*, with which it is very commonly confounded, and which it resembles in most of its essential characters, and in general aspect can hardly be distinguished, except on a close inspection. My friend Professor J. Agardh, however, has judged differently, and done me the honor of giving it my name, in which he has been followed by Endlicher, in his useful Synopsis. My attention is thus again directed to the subject, and I have deemed it best to give a figure in which all the characters by which it differs from *C. tetragonum* being depicted, botanists may form their own opinion as to the validity of its claims to rank as a species. I should have adopted the specific name of Agardh, had I not received from M. Lenormand specimens, exactly similar to our British ones, bearing a name conferred by Bonnemaison, which, I believe, has priority to that proposed by Agardh, though at present I am not aware where it has been published.

The character by which *C. brachiatum* appears *essentially* to differ from *C. tetragonum*, is to be found in the ultimate ramuli, which in this are constantly subulate, gradually tapering from the base to the apex; and in that are suddenly acuminate, or, as it were, *mucronate*. This is what originally induced me to admit the species, which I found indicated in the unpublished 'Algæ Appinenses' of Carmichael, under the name *C. fruticulosum*; and so far as my observations have gone, this character appears to be constant. Minor and less important distinctions may be taken from the length of the joints, and their *form*, which is cylindrical in the present species and oval in *C. tetragonum*. Both plants are equally common, and found in the same situations.

Fig. 1. CALLITHAMNION BRACHIATUM:—*of the natural size*. 2. Penultimate branches. 3. A plumule, bearing tetraspores. 4. Apex of a fertile pinule. 5. A plumule bearing a favella. 6. Joint of a main branch or of the stem:—*all magnified*.

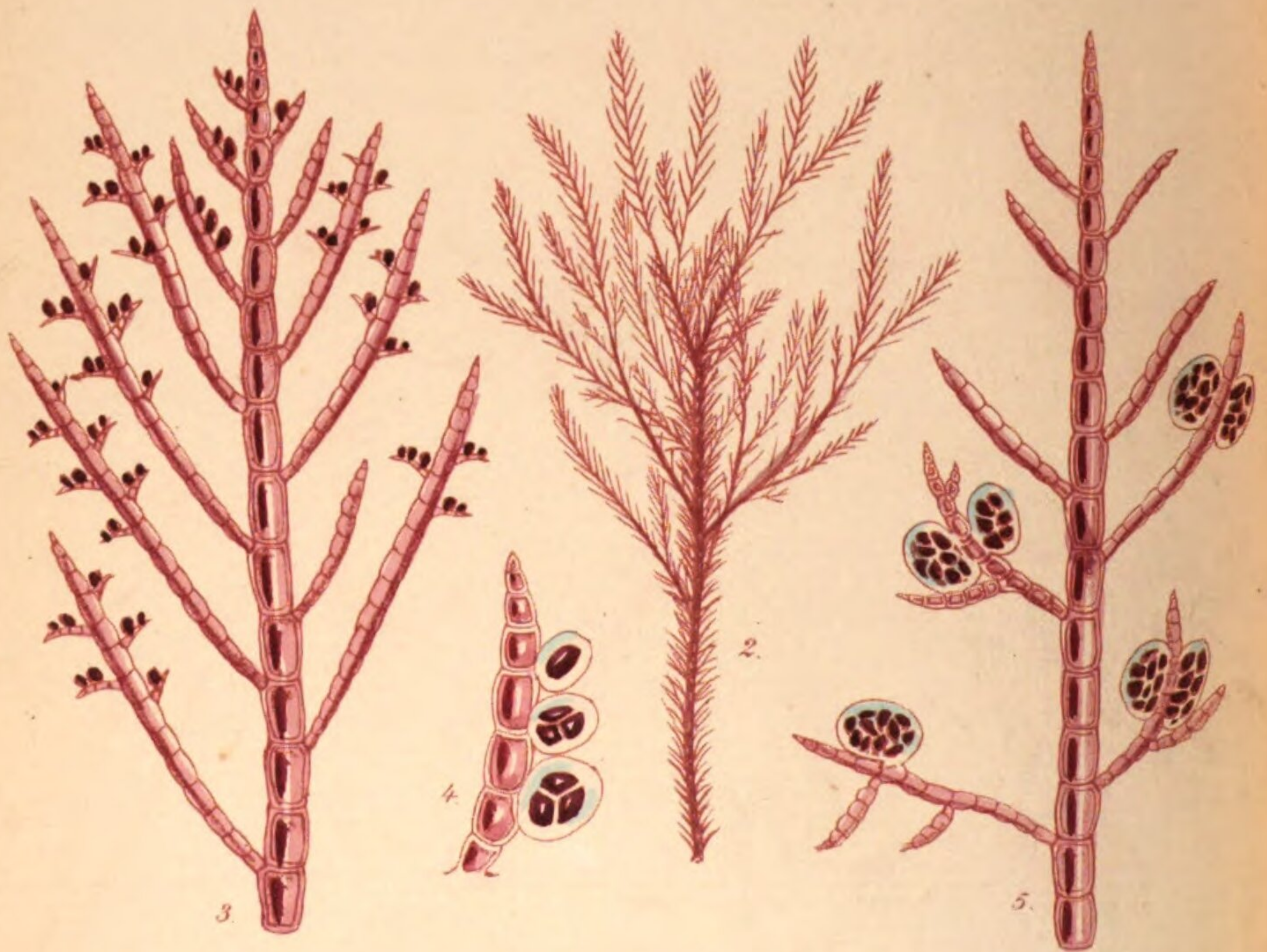
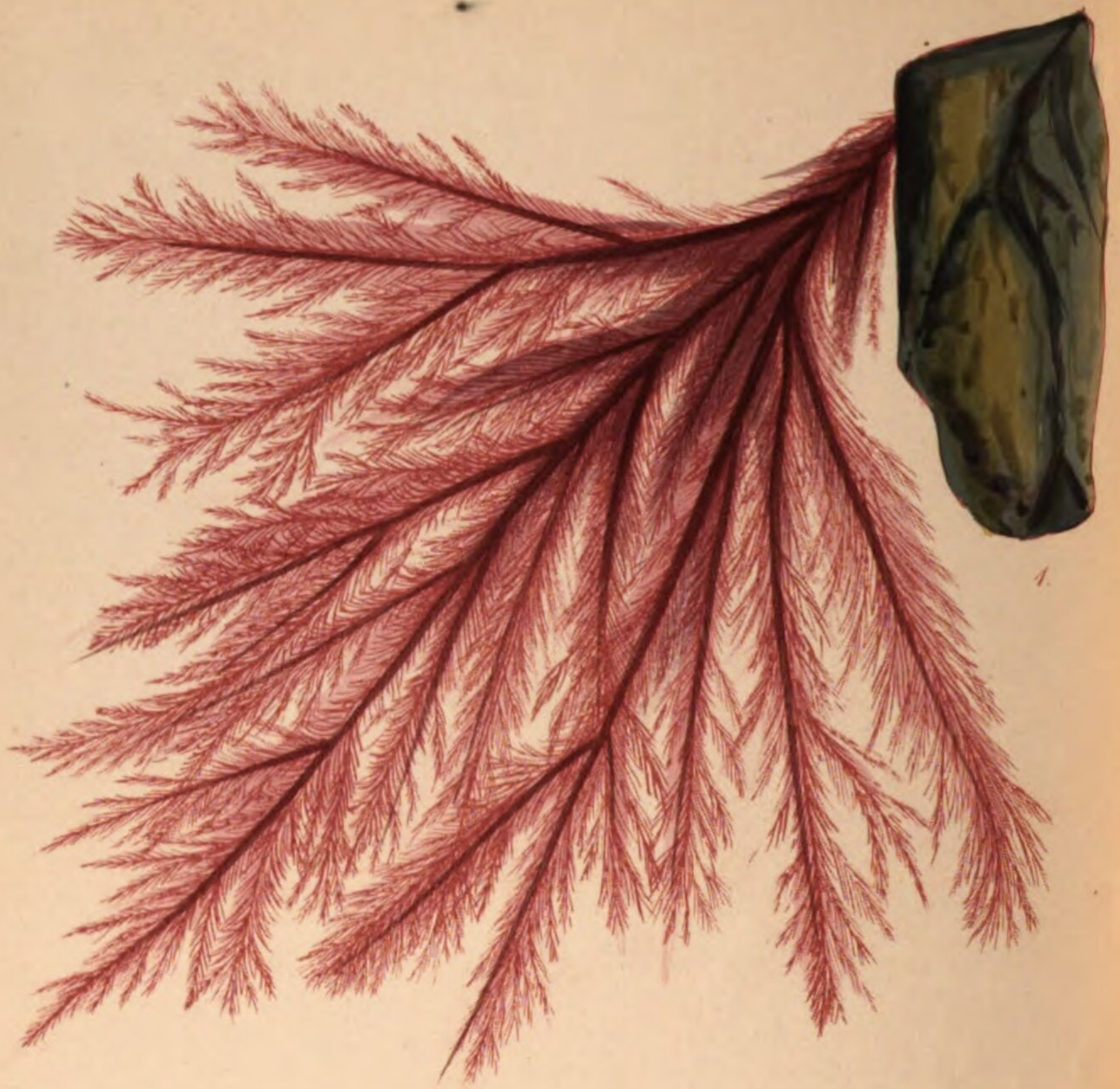


PLATE CLXXXVIII.

CALLITHAMNION TETRICUM, *Ag.*

GEN. CHAR. *Fronde* rosy or brownish red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external tetraspores, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*), from *καλος*, *beautiful*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *tetricum*; rigid, shrubby; stem and branches robust, densely covered with ramuli, shaggy below, plumulate above; plumules crowded, quadrifarious, simply pinnate; pinnæ acute, tapering to the base, erecto-patent; articulations twice or thrice as long as broad; tetraspores elliptical, minute, sessile on short lateral processes of the pinnæ.

CALLITHAMNION *tetricum*, *Ag. Sp. Alg.* vol. ii. p. 179. *Harv. in Hook. Br. Fl.* vol. ii. p. 342. *Harv. in Mack. Fl. Hib.* part 3. p. 214. *Harv. Man.* p. 108. *Wyatt, Alg. Danm.* no. 141. *Endl. 3rd Suppl.* p. 34.

PHLEBOTHAMNION *tetricum*, *Kütz. Phyc. Gen.* p. 374.

CONFERVA *tetrica*, *Dillw. t.* 81. *E. Bot. t.* 1915.

HAB. On the perpendicular faces of rocks within tide marks, from half-tide level to low-water mark. Perennial. Summer. Common on the shores of the south of England and south and west of Ireland; less frequent on the east coast. Lambay, *Mr. Mc' Calla*. Channel Islands.

GEOGR. DISTR. Northern coasts of France, common.

DESCR. *Root*, a large disc, densely covered with interwoven fibres. *Fronde*s two to eight inches long, or more, tufted, fruticose; *stems* as thick, or twice as thick as pack-thread, much branched, the branches long, and either simple or again divided, alternate, spreading on all sides, and densely clothed with shaggy or hair-like, coarse, irregularly divided ramuli, so that the divisions of the frond have the appearance of rough ropes; upper and younger divisions clothed with longer and more slender branchlets, which bear alternate spreading plumules: similar plumules spring from all parts of the shaggy branches, growing among the irregular ramuli. *Plumules* long and narrow, simply pinnate, straight; pinnæ erecto-patent, tapering to an acute point, and much narrowed at base. *Articulations* about twice as long as broad, somewhat constricted at the dissepiments. *Tetraspores* two or three together, elliptical, minute, sessile on the inner faces of short ramuli, which issue from the sides of the pinnæ. *Favellæ* binate, borne on the pinnæ (frequently shortened) of less regular plumules. *Colour* a very dark, dull, brownish red. *Substance* rigid, not very closely adhering to paper, soon decaying in fresh water after the plant has been once dried, and then exhaling the odour of violets.

This is the coarsest of the British *Callithamnia*, resembling, in its bushy habit, shaggy tufts of *Sphacelaria scoparia*, and is often of a very dark brown colour, with little trace of the purple endochrome characteristic of the genus. At other times, much more shaggy specimens with a brighter colour are found, and some of these resemble large specimens of *C. Borreri*. Specimens collected at various seasons and from different localities differ much in the abundance and regularity of the plumules, as well as in the greater or less development of the hair-like ramuli. There are always, however, characters to be found quite sufficient to separate *C. tetricum* from any British species.

Mr. Dillwyn was the first author to notice this species, having found it abundantly in the neighbourhood of Swansea. He states that it is found generally in pools left by the tide, attached either to rocks or parasitical on Algæ. I have more commonly found it on the perpendicular faces of rocks which are left bare at low water, either perfectly exposed or shaded by hanging fronds of *Fucus serratus* and *nodosus*. In such situations, on the west of Ireland, it may often be found covering large spaces of rock, and growing luxuriantly.

None of our British species are very closely related to *C. tetricum*, but it is interesting to find in the *C. hirtum* of Auckland Islands, and *C. scoparium* of the Falklands, its southern analogues, resembling it in many respects, but readily distinguishable by obvious characters.

Fig. 1. *CALLITHAMNION TETRICUM*, tufts :—*of the natural size*. 2. Portion of an upper branch :—*slightly magnified*. 3. A plumule with tetraspores. 4. Ramulus from the same. 5. A plumule with favellæ :—*more highly magnified*.



PLATE CCLXXIX.

CALLITHAMNION HOOKERI, *Ag.*

GEN. CHAR. *Fronde* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants: 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*), from *καλλος*, *beauty*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *Hookeri*; stem setaceous, inarticulate or nearly opaque, with traces of joints, simple, set with one or more series of alternate, spreading, flexuous branches, the smaller of which are articulated, and all densely plumulate; plumules patent, naked below, pinnate or subbipinnate above; the pinnæ or pinnules subhorizontal or divaricate, the lowest longest; articulations twice or thrice as long as broad; tetraspores numerous, sessile on the pinnules; favellæ terminal, binate.

CALLITHAMNION *Hookeri*, *Ag. Sp. Alg.* vol. ii. p. 179. *Harv. in Hook. Br. Fl.* vol. ii. p. 341. *Harv. Man.* ed. 1. p. 106.

CALLITHAMNION *lanosum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 341. *Wyatt, Alg. Dan.* no. 139.

CALLITHAMNION *spinosum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 345. *Harv. Man.* ed. 1. p. 111.

PHLEBOTHAMNION *Hookeri*, *Kütz. Phyc.* p. 375. *Sp. Alg.* p. 653.

PHLEBOTHAMNION *spinosum*, *Kütz. Sp. Alg.* p. 653.

CERAMIIUM *Hookeri*, *Ag. Syn.* p. xxvii. *Hook. Fl. Scot.* part 2. p. 85. *Ag. Syst.* p. 138.

CONFERVA *Hookeri*, *Dillw. Conf.* t. 106.

HAB. On various Algæ between tide-marks, also on rocks near low water-mark, and at a greater depth. Annual. Summer. Dispersed along the British shores, from Orkney to Cornwall, and in Ireland; not uncommon.

GEOGR. DISTR. Atlantic shores of Europe: but rare.

DESCR. *Root* a minute disc. *Fronde*s densely tufted, one to four inches in length, and as much in expansion, having a conical or pyramidal outline, the lower branches being longest, the rest gradually shorter upwards, not perfectly distichous, and sometimes densely bushy, with branches turned in every direction. *Stem* mostly undivided, as thick as a hog's bristle, opaque and full of veins, or (in young specimens) obscurely marked with joints, closely set throughout with lateral, very patent branches, similar to the main stem.

These branches bear a second and third series; the lesser divisions being pinnated with alternate, ovate, patent, stipitate plumules. *Plumules* simply or doubly pinnate, the pinnules long and widely spreading, sometimes recurved. *Articulations* short in all parts where they are visible. *Tetraspores* numerous, spherical, lining the inner edge of the pinnules, one borne by every articulation. *Favellæ* binate, mostly terminal, on less regularly pinnate branches. *Colour* varying from a full purplish to a brownish red; sometimes pale pink, fading rapidly in fresh water to a dirty white. *Substance* flaccid, adhering to paper, and soon rotting if moistened after having been dried.

A common but very variable species, and yet not difficult to understand when a few leading features are kept in view. Its most striking characters are the opaque stem and branches, the short articulations, and the very patent or divaricated ramuli, frequently pinnulated above. It verges on the one hand to *C. roseum*, and on the other to *C. Borreri* and to *C. polyspermum*, but is readily recognized from each of these by some one of its characters.

By the synonyms quoted, it will be seen that at one time I made *three* species of what I now regard as one: and if I had added a fourth (*C. affine*), I had perhaps acted discreetly—but I reserve that species for a future examination. Those who know the difficulty attending the determination of these plants, will best excuse these and similar mistakes.

C. Hookeri is named in honour of Sir Wm. J. Hooker, by whom it was first discovered, and communicated to Dillwyn as a new species.

Fig. 1. *CALLITHAMNION HOOKERI*:—*the natural size*. 2. Base of a smaller branch, bearing three plumules. 3. Small branch with a favella. 4. Part of a plumule, bearing tetraspores. 5. A tetraspore:—*all more or less magnified*.

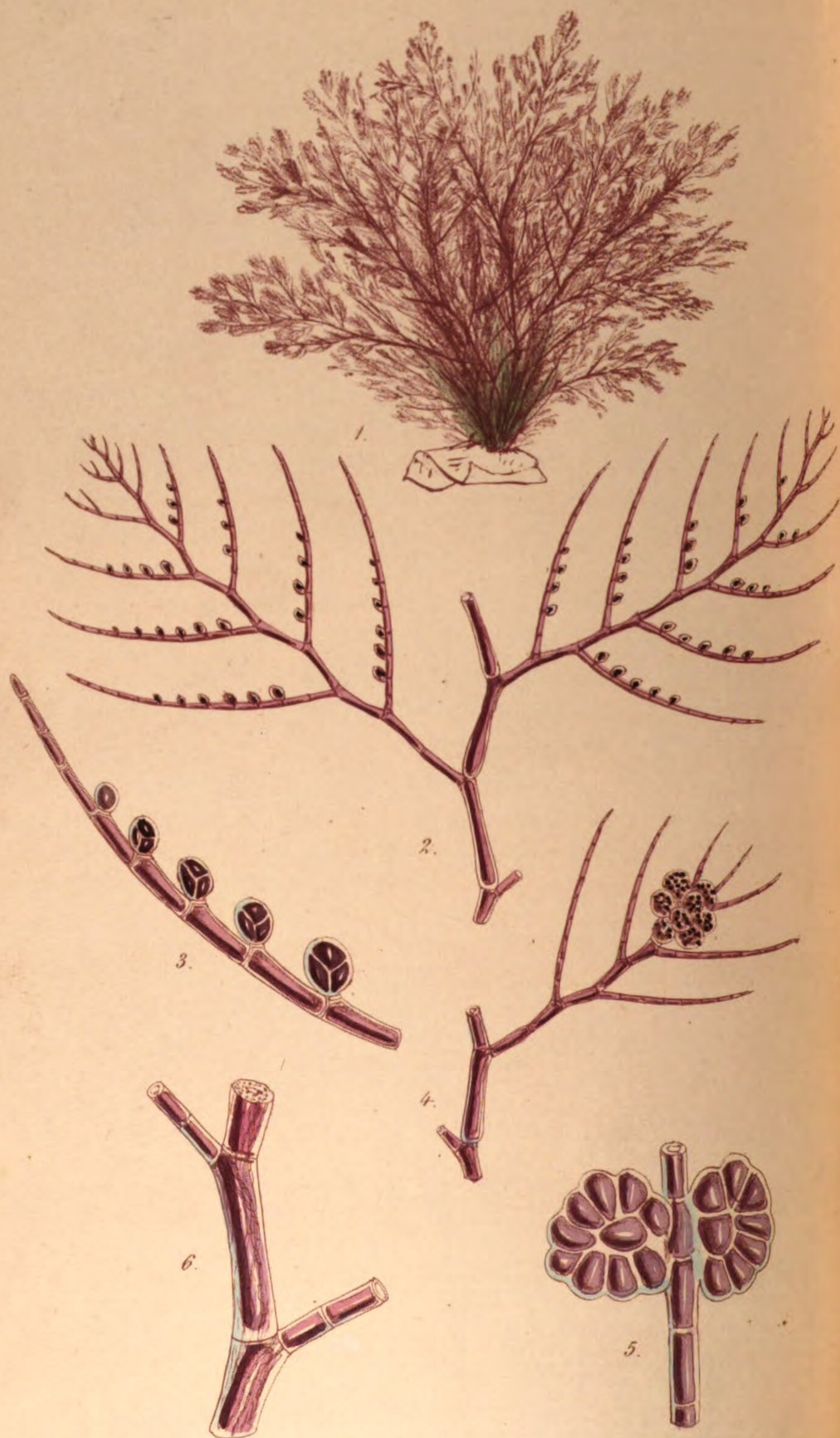


PLATE CCXXX.

CALLITHAMNION ROSEUM, *Lyngb.*

GEN. CHAR. *Frond* rosy, or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλος*, *beautiful*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *roseum*; stems much and loosely branched; secondary branches long, flexuous, subdistichously plumulate; plumules lax, with a roundish outline, crowded towards the tops of the branches, simply pinnate; pinnæ long, spreading, curved; articulations of the stem and branches four and five times as long as broad, more or less filled with veins; those of the pinnæ twice or thrice as long as broad; tetraspores elliptical, four or five on each pinna, from the lower joints; favellæ tufted.

CALLITHAMNION *roseum*, *Lyngb. Hyd. Dan.* p. 126. t. 39 (?). *Ag. Sp. Alg.* vol. ii. p. 164. *Harv. in Hook. Br. Fl.* vol. ii. p. 341. *Harv. in Mac. Fl. Hib.* part 3. p. 214. *Harv. Man.* p. 106. *Wyatt, Alg. Danm.* no. 44. *Endl. 3rd Suppl.* p. 34.

PHLEBOTHAMNIUM *roseum*, *Kütz. Phyc. Gen.* p. 375. t. 44. f. 1.

CERAMIUM *roseum*, *Roth, Cat. Bot.* vol. iii. p. 145. *Ag. Syst.* p. 139.

CONFERVA *rosea*, *E. Bot.* t. 966. *Dillw.* t. 17 (?).

HAB. On rocks and the larger *Fuci*, near low-water mark; frequently in æstuaries, or muddy places. Annual. Summer. Not uncommon.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Fronds* densely tufted, three or four inches long. *Stems* as thick as hog's bristle at the base, in young plants pellucid, but in old, opaque and full of veins, or internal fibres, excessively branched and bushy; the branches alternate, repeatedly divided. Lesser branches somewhat virgate, set throughout their length, at nearly every joint, with alternate simply pinnated plumules, of roundish or ovate outline. *Pinnæ* long, more or less incurved, either quite simple, or furnished with one or two small pinnulæ near the apex. *Articulations* of the stem and branches four or five times as long as broad, or more, somewhat swollen at the joints; those of the lesser branches and ramuli gradually shorter. *Endochrome* nearly filling the tube. *Tetraspores* elliptical, sessile on the inner faces of the pinnæ, one at each of the four or five lowermost joints. *Favellæ* generally terminating truncated branches, two or more together: sometimes several united in a berry-like mass. *Colour* in young specimens a fine purple-lake, in old brownish, becoming brighter in fresh-water. *Substance* membranaceous and soft, closely adhering to paper, but not gelatinous.

Callithamnion roseum is one of the longest described of the genus, and ought therefore, one would think, to be the best known. But, as with many old species, several plants which are now distinguished, were formerly confounded under this name, and thus it becomes a doubtful matter to which of the modern species the original synonyme *roseum* attaches. The species was first defined by Roth in his *Catalecta*. I have seen no specimen of the plant of this author, and the *type* which I have adopted, and here figure, is derived from a specimen received from Mr. Dawson Turner, and compared many years ago by that gentleman with Roth's plant, and from another sent by Mr. Borrer, as the plant of English Botany. These two specimens agree with each other and also with the specimens published by Mrs. Wyatt, in *Algæ Danmonienses*. As far, therefore, as the British flora is concerned, our notions of *Cal. roseum* are tolerably definite. It would be very desirable were our plant compared with the herbaria of continental authors.

Fig. 1. *CALLITHAMNION ROSEUM*:—*of the natural size*. 2. A pair of plumules and three articulations of a branch. 3. Part of a pinna, with tetraspores. 4. A small branch, bearing a cluster of favellæ. 5. Binate favellæ. 6. Joints from the lower part of the stem:—*all more or less highly magnified*.



PLATE CCLXII.

— CALLITHAMNION BYSSOIDEUM, *Arn.*

GEN. CHAR. *Fronde* rosy, or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branches, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλλος*, *beauty*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *byssoides*; stems exceedingly slender, flaccid, and byssoid, much divided; branches lanceolate in outline, virgate, set with numerous long, slender, flexuous, pinnate or subbipinnate plumules; articulations of the branches eight times, of the ramuli four times as long as broad; tetraspores, one or two, sessile on the pinnules, elliptical; favellæ binate, subterminal.

CALLITHAMNION *byssoides*, *Arn. MSS. Harv. in Hook. Br. Fl.* vol. ii. p. 342. *Wyatt, Alg. Damn.* no. 185. *Harv. Man.* ed. 1. p. 107.

HAB. On several Algæ, in tide-pools near low-water mark; on *Codium tomentosum*, especially. Annual. Summer. Whitsand Bay, *Dr. Jacob*. Devonshire, *Mrs. Griffiths*. Salcombe, *Mrs. Wyatt*. Plymouth, *Rev. W. Hore and Dr. Cocks*. Portaferry, Strangford Lough, *Mr. W. Thompson*. Dublin Bay, and Cork Harbour, *W. H. H.* Not an uncommon species.

GEOGR. DISTR. Not noticed out of Britain.

DESCR. *Filaments* extremely slender, as fine as cobwebs, densely tufted, from two to four inches long, excessively branched in a decompound-pinnate manner, all the divisions alternate and distichous. The whole frond, when displayed on paper, has an ovate or pyramidal outline, the lowermost branches being longer than the upper ones; each individual branch is narrow-lanceolate, when taken in connection with the plumules with which it is clothed. These plumules are slender, and flexuous, simply or doubly pinnated, laxly set, with few and distant pinnules; the latter very long, and destitute of ramuli or lateral processes. *Articulations* of the stem and branches of great length, 6–8 times longer than broad, destitute of internal veins, except in the lower part of the stem; articulations of the ramuli at least four times as long as broad, but often more. *Tetraspores* elliptical, sessile, rather large, borne on the sides of the pinnules, towards the base, one or two, rarely more, on each pinnule. *Favellæ* binate, generally terminating truncated branches. *Colour*, a fine rosy lake, with a slightly purple or sometimes brown hue. *Substance* exceedingly tender and gelatinous, closely adhering to paper in drying.

This species was first collected, it would seem, by Dr. Jacob at Whitsand bay, and first recognised as new by Professor Walker Arnott, from whom I first received specimens under this name,—a name adopted in the British Flora, and now generally recognised. *E. byssoideum* is one of the softest and most gelatinous of the genus, having exceedingly slender fronds, growing in dense tufts. To the naked eye it frequently bears much resemblance to *C. corymbosum*, so much that it sometimes requires a microscope to determine to which species the specimen under examination may belong. The ultimate branching, and the position of the tetraspores will then afford an easily seen character, by which the two plants may be distinguished. There is a much closer affinity, indeed, between *C. byssoideum* and *C. roseum*, than between the former and *C. corymbosum*. From *C. roseum* our plant is chiefly known by its much greater delicacy and softer substance, and its adhering much more closely to paper, and being more glossy when dry.

Fig. 1. CALLITHAMNION BYSSOIDEUM; a tuft:—*of the natural size*. 2. Part of branch, with bipinnate plumule. 3. Pinnules, bearing tetraspores from the same. 4. Part of a branch with favellæ. 5. A favella. 6. Articulations from the lower part of the stem:—*all more or less highly magnified*.

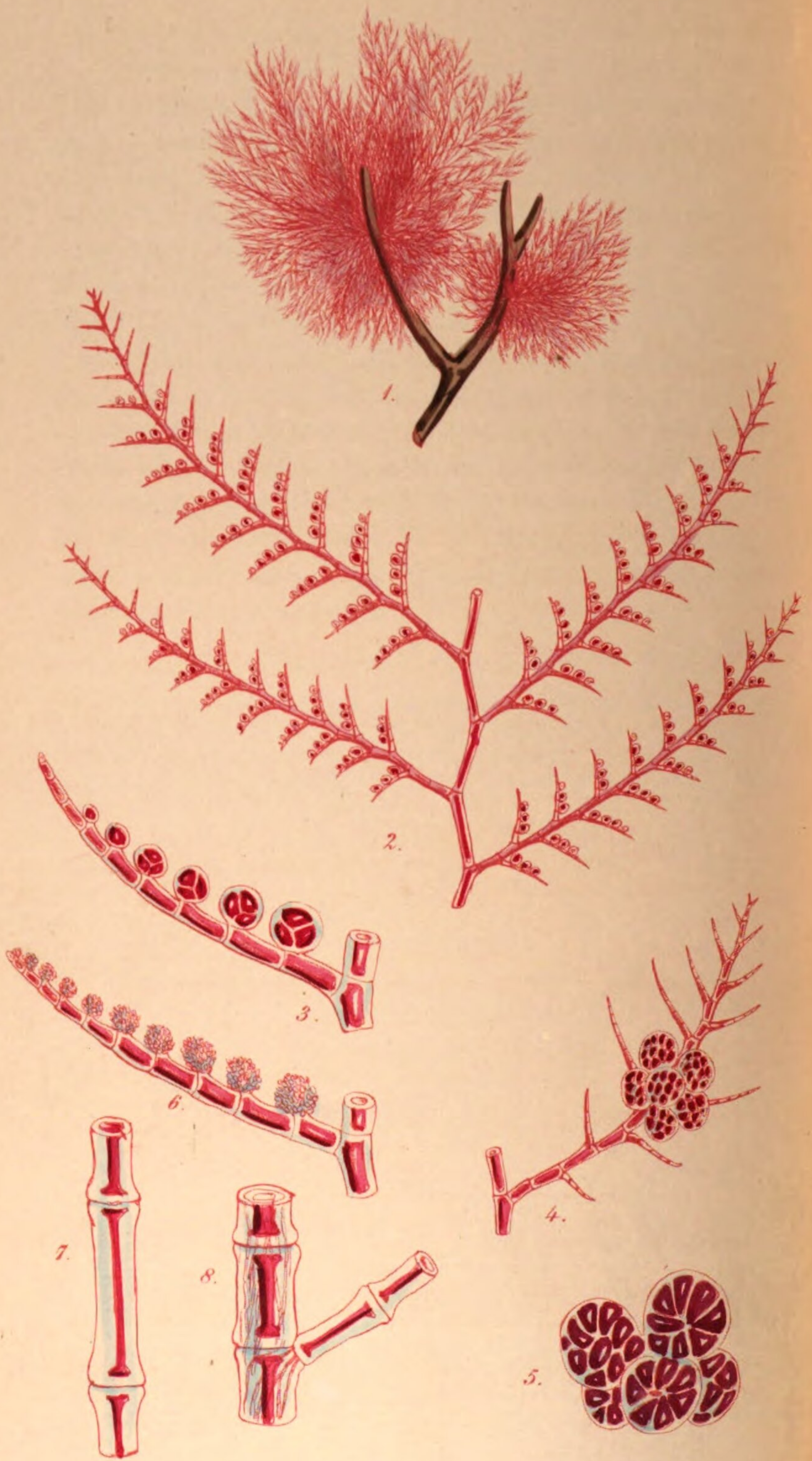


PLATE CCXXXI.

/ CALLITHAMNION POLYSPERMUM, *Ag.*

GEN. CHAR. *Frond* rosy, or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλος*, *beautiful*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *polyspermum*; tufts globose; filaments slender, delicate, loosely much-branched, irregularly divided below, distichously plumulate above; plumules long and narrow, simply pinnate; pinnæ short, simple, patent, acute, spine-like; articulations of the branches with a very narrow coloured tube, four or five times as long as broad, of the ramuli short; tetraspores globose, lining the inner face of the pinnæ.

CALLITHAMNION *polyspermum*, *Ag. Sp. Alg.* vol. ii. p. 169. *Harv. in Hook. Br. Fl.* vol. ii. p. 342. *Harv. in Mack. Fl. Hib.* part 3. p. 214. *Harv. Man.* p. 108. *Wyatt, Alg. Danm.* no. 140. *Endl. 3rd Suppl.* p. 34.

CALLITHAMNION *Grevillii*, *Harv. in Hook. Br. Fl.* vol. ii. p. 345. *Harv. Man.* p. 110. *Harv. in Mack. Fl. Hib.* part 3. p. 215.

CALLITHAMNION *roseum*, *Grev. Fl. Edin.* p. 311 (not of *Br. Fl.*)

CALLITHAMNION *purpurascens*, *Johnst. Berw. Fl.* vol. i. p. 240.

PHLEBOTHAMNIUM *polyspermum*, *Kütz. Phyc. Gen.* p. 374.

HAB. On various Algæ between tide-marks, frequently on *Fucus vesiculosus* and *F. serratus*. Annual. Summer. All round the coast.

GEOGR. DISTR. Atlantic shores of Europe.

DESCR. *Root* discoid, small. *Tufts* globose, one to three inches in diameter, dense. *Filaments* capillary, excessively branched; *stem* zigzag, with short articulations, traversed by a few fibres but not thereby rendered opaque, irregularly divided, and either somewhat bare or well furnished with alternate, secondary branches. *Branches* long and slender, zigzag, bearing a second or third series, the latter alternately plumulate with considerable regularity. *Plumules* usually long and narrow, simply pinnate, or occasionally the upper part more compound. *Pinnæ* usually short, patent, subulate, sometimes recurved, in luxuriant specimens so far lengthened that the outline of the plumule becomes ovate. *Articulations* of the branches 4–5 times as long as broad, with a very narrow bag of endochrome; of the ramuli twice as long as broad, fully coloured. *Tetraspores* usually lining the inner faces of the pinnæ, globose. *Favellæ* of large size, in dense clusters, bursting from the rachis of a distorted plumule. Occasionally the place of tetraspores is occupied by round bodies (antheridia? or rather viviparous tetraspores) formed of innumerable minute cells, strung together. *Colour*,

a brownish red, sometimes purplish. *Substance* membranaceous, adhering to paper. On being re-moistened, the frond exhales the odour of violets.

A common species, but variable in its characters, and gradually approaching *C. roseum* on the one hand, and *C. Hookeri* on the other. Our plate represents what we regard as the typical form, or *idea*, of the species. It is remarkable for the short, awl-shaped, simple pinnæ, beaded, on the inner face, with globose tetraspores. From this I formerly distinguished *C. Grevillii* by a plumule of broader and shorter outline, whose uppermost pinnæ were pinnulate at top. A more intimate acquaintance with the species of this genus, and an examination of a profusion of specimens exhibiting numerous variations from the original type of *C. polyspermum*, but all more referable to it than to any other species, have made me cautious of admitting the value of the characters I had formerly considered belonging to *C. Grevillii*. I now regard that species therefore as an imperfectly developed form of *C. polyspermum*, whose uppermost pinnæ are passing into the state of plumules.

C. polyspermum more frequently grows on the coarser *Fuci* than any other species, and sometimes clothes them with densely set, globose tufts, which in old age become blended together, concealing the greater part of the plant on which they grow. The finest specimens I have received were collected at Mount Edgecombe, by my liberal Plymouth correspondents, Messrs. Hore, Rohloff, and Cocks.

Fig. 1. CALLITHAMNION POLYSPERMUM:—*of the natural size.* 2. Portion of a branch, with four plumules. 3. Pinnæ with tetraspores. 4. Plumule with favellæ. 5. Favellæ detached. 6. Pinna with antheridia? 7. Joints from a branch. 8. Joints from the lower part of the stem:—*all more or less magnified.*



PLATE CCCVIII.

CALLITHAMNION FASCICULATUM, *Harv.*

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants: 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like *receptacles* (*favellæ*), seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Ag.*),—from *καλλος*, *beauty*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *fasciculatum*; tufted; branches erect, flexuous, level-topped; plumules elongate, erect, linear-obovate, truncate; pinnæ long and flexuous, the lowermost simple, appressed, the upper erecto-patent, branching toward the tip; articulations of the branches veiny, thrice as long as broad, of the pinnæ once or twice as long as broad, with contracted dissepiments.

CALLITHAMNION *fasciculatum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 343. *Harv. Man. ed. 2.* p. 179. *Kütz. Sp. Alg.* p. 652.

HAB. At Yarmouth, *Mr. Borrer*, in *Herb. Hooker*.

GEOGR. DISTR. —?

DESCR. *Frond* from two to three inches high, nearly bare of branches below, much branched and tufted upwards, bushy, capillary; the apices of the branches looking, to the naked eye, as if truncated or corymbose. *Branches* long and flexuous, very erect, their upper half closely plumulate. *Plumules* long and narrow, with a linear-obovate or spathulate outline, erect, the lowermost pinnæ quite simple, moniliform, with contracted joints and acute terminal cells; the uppermost gradually longer and more spreading, branching at the apex. *Articulations* of the branches veiny, from three to four times as long as broad; of the lesser branches (or rachides of the plumules) about twice as long as broad; of the pinnules oval, twice as long as broad, with very contracted dissepiments. *Tetraspores* elliptical, mostly solitary, toward the base of a pinnule. *Colour* a fine purple-red. *Substance* membranaceous, adhering to paper.

I have deferred figuring *Cal. fasciculatum* of the Brit. Flora to this late period, in the hope, disappointed hitherto, that some

fortunate collector would find it again, and thus establish a species which at present rests upon a single specimen preserved in the herbarium of Sir W. J. Hooker, and collected early in the present century. The figure now given exhibits all the characters of the species, faithfully copied from a small fragment of the Hookerian specimen. It will be seen that the habit, to the naked eye, is that of *C. corymbosum*, while the microscopic characters are nearer those of *C. Borreri*, than those of any other species. On comparing our present figure with our TAB. CLIX. differences so important will be seen between the two plants as to forbid their being confounded together, and thus we are compelled to retain *C. fasciculatum*, although it rests on such unsatisfactory evidence as a solitary specimen. The diameter of the filament is greater than that of the usual state of *C. Borreri*, and much greater than that of *C. roseum*, and the constricted dissepiments of the ramuli are very characteristic. It will be seen by Fig. 6, that the stems are those of a "*Phlebothamnion*," Kützinger.

Fig. 1. CALLITHAMNION FASCICULATUM:—*the natural size*. 2. A plumule or pinnated branchlet from the same. 3. One of the lowermost pinnae. 4. One of the upper pinnae. 5. Pinnae with a tetraspore. 6. Small portion of one of the main branches:—*all more or less magnified*.

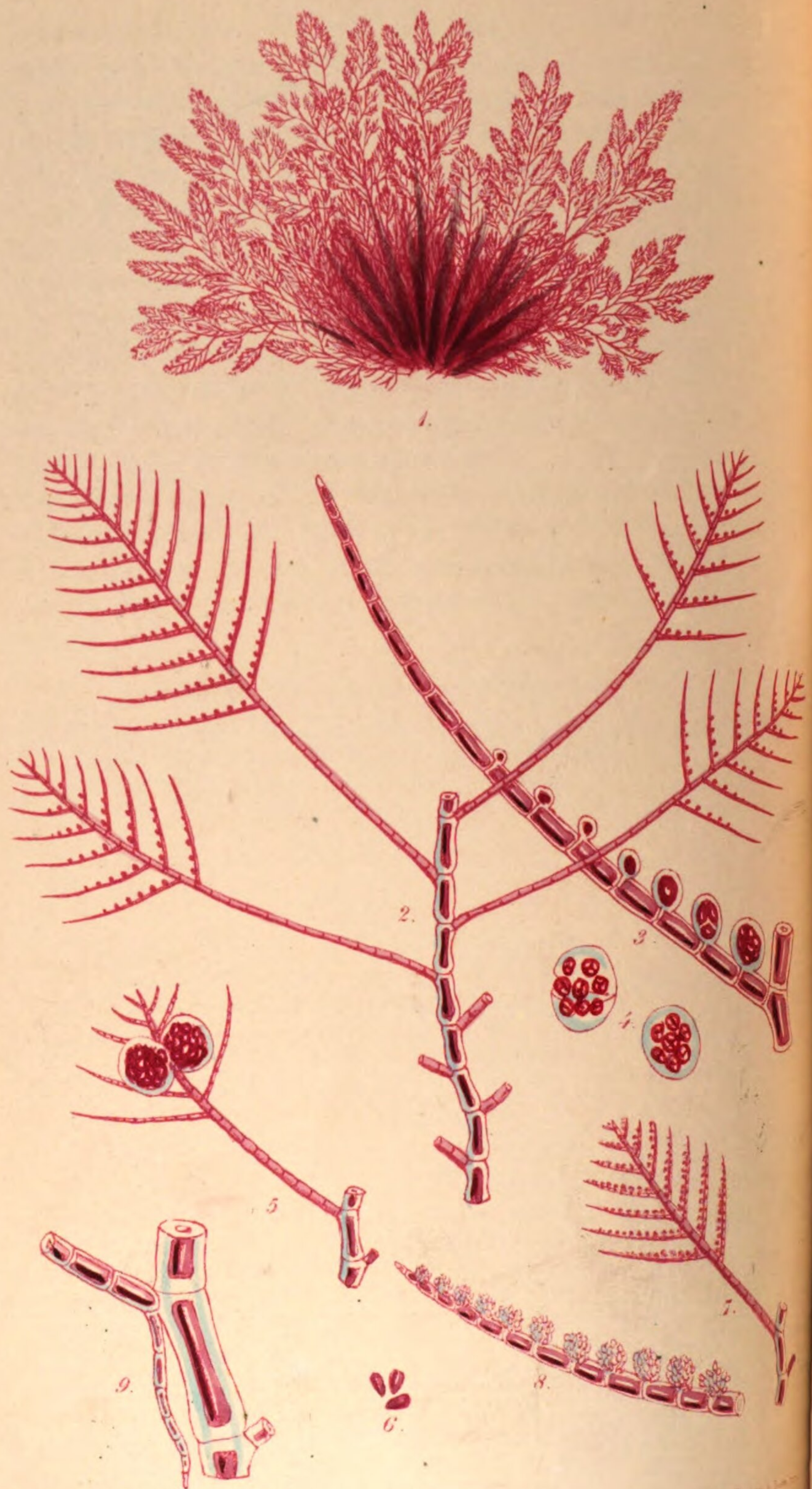


PLATE CLIX.

CALLITHAMNION BORRERI, *Ag.*

GEN. CHAR. *Frond* rosy, or brownish red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλὸς*, *beautiful*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *Borreri*; much branched, sub-distichous, rigid or flaccid; branches set with distichous plumules which are bare of ramuli in their lower half, and simply pinnate in their upper; pinnæ long, patent, subulate, simple (or ramulose at top), the lowermost longest; articulations of the branches 2–5 times, of the pinnæ about twice as long as broad; tetraspores roundish, sessile on the inner face of the pinnæ; favellæ two-lobed, near the apex of the lesser branches.

CALLITHAMNION *Borreri*, *Ag. Sp. Alg.* vol. ii. p. 170. *Harv. in Hook. Br. Fl.* vol. ii. p. 344. *Harv. Man.* p. 110. *Endl. 3rd Suppl.* p. 34. *Kütz. Phyc. Gen.* p. 372.

CALLITHAMNION *seminudum*, *Ag. Bot. Zeit.* 1827. p. 637. *Ag. Sp. Alg.* vol. ii. p. 167. *Harv. in Hook. Br. Fl.* vol. ii. p. 344. *Wyatt, Alg. Danm.* no. 187. *J. Ag. Alg. Medit.* p. 72. *Endl. 3rd Suppl.* p. 34.

CERAMIUM *pinnulatum*, *Ag. Syst.* p. 139.

CERAMIUM *miniaturum*, *Ag. Syst.* p. 141.

CONFERVA *Borreri*, *Sm. E. Bot.* t. 1741.

HAB. On mud-covered rocks near low-water mark. Annual. Summer. Rather rare. Yarmouth, *Mr. Borrer*. Torquay, *Mrs. Griffiths*. Sidmouth, *Miss Cutler*. Ilfracombe, Land's End, and Swansea, *Mr. Ralfs*. Falmouth, *Miss Warren*. Remarkably fine at Plymouth, *Rev. W. S. Hore*, *Mr. Rohloff*, and *Dr. Cocks*. Clontarf, *Miss Ball*. Howth, *Miss Gower*.

GEOGR. DISTR. Atlantic shores of France and Spain. Mediterranean and Adriatic Seas.

DESCR. *Fronds* densely tufted, from one to four or five inches in height, the larger specimens excessively branched, capillary, many times divided in an alternately pinnate manner; branches more or less distichous, long, clothed with three or four series of lesser branches, the last of which are set with alternate, distichous plumules, from a quarter to nearly half an inch in length. *Plumules* issuing at almost every joint, alternate, patent, slender, naked in the lower part to a point beyond their middle; the upper half pinnate, a pinna issuing from every joint. *Pinnæ* alternate, subulate, the lowest longest, the rest gradually shorter to the apex. On luxuriant specimens I have frequently observed slender, root-like fibres to issue from the lowest joint of a plumule (fig. 9). *Articulations* of the stem from three to

five times longer than broad, with a wide limbus, and narrow bag of endochrome, destitute of veins: articulations of the lesser branches and ramuli about twice as long as broad. *Tetraspores* roundish, sessile on the inner face of the pinnæ, one or several on each pinna; sometimes containing *eight* grains, each of which at maturity separates into four pieces (and becomes a tetraspore! [fig. 4]). On some individuals the place of tetraspores is supplied by clusters of hyaline cells, collected in dichotomous threads, which are supposed to be *antheridia* (fig. 7, 8). *Favellæ* (fig. 5) two-lobed, containing many large grains. *Colour*, a fine deep lake, or rosy-red, brownish toward the base: staining fresh water carmine. *Substance* rather rigid when fresh, soon becoming flaccid, and closely adhering to paper.

This very handsome species, whose essential character consists in having the lower half of its plumules bare of ramuli, while the upper is pinnated, the pinnæ spreading like the rays of a fan, was first discovered, about forty years ago, by Mr. Borrer of Henfield, who has added so much to our knowledge of British Botany, and whose zeal in the pursuit of his favourite science is still as ardent as ever. This, one of his early discoveries in a tribe of plants which he very successfully studied, has been consecrated to his honour by Sir James E. Smith.

It is nearly related to several other species, especially to *C. roseum*, *C. polyspermum*, and *C. tripinnatum*; from the two former of which it is known by the shape of its plumules, from the latter, chiefly by the absence of the axillary ramulus. Unlike as, at first sight, this plant may appear to *C. gracillimum*, very luxuriant specimens closely resemble that species in habit, and exhibit a nearer approach in microscopic character than could be supposed. I unhesitatingly refer Agardh's *C. seminudum*, which I have received from that author himself, as well as from several other continental friends, to our *Borreri*: they are undistinguishable. The noblest specimens of this species which I have seen, are those sent to me by my kind friends at Plymouth, to whose liberality I am indebted for a bounteous supply. On some of these I have observed, (and Mrs. Griffiths has, independently, made the same observation,) that the *tetraspores*, so called, contain *eight* sporules, and that each of these at maturity becomes a *tetrasporule*! On other individuals from the same locality we find the place of tetraspores supplied by those little tufts of glassy cells which, in this genus, obtain the name of *antheridia*.

Fig. 1. CALLITHAMNION BORRERI:—*of the natural size*. 2. Part of a branch with plumules. 3. A pinna with tetraspores. 4. Compound tetraspores. 5. A ramulus with favella. 6. Spores from the same. 7. A plumule with antheridia. 8. Pinna of the same. 9. Joints of a main branch, with radicular process:—*all more or less magnified*.



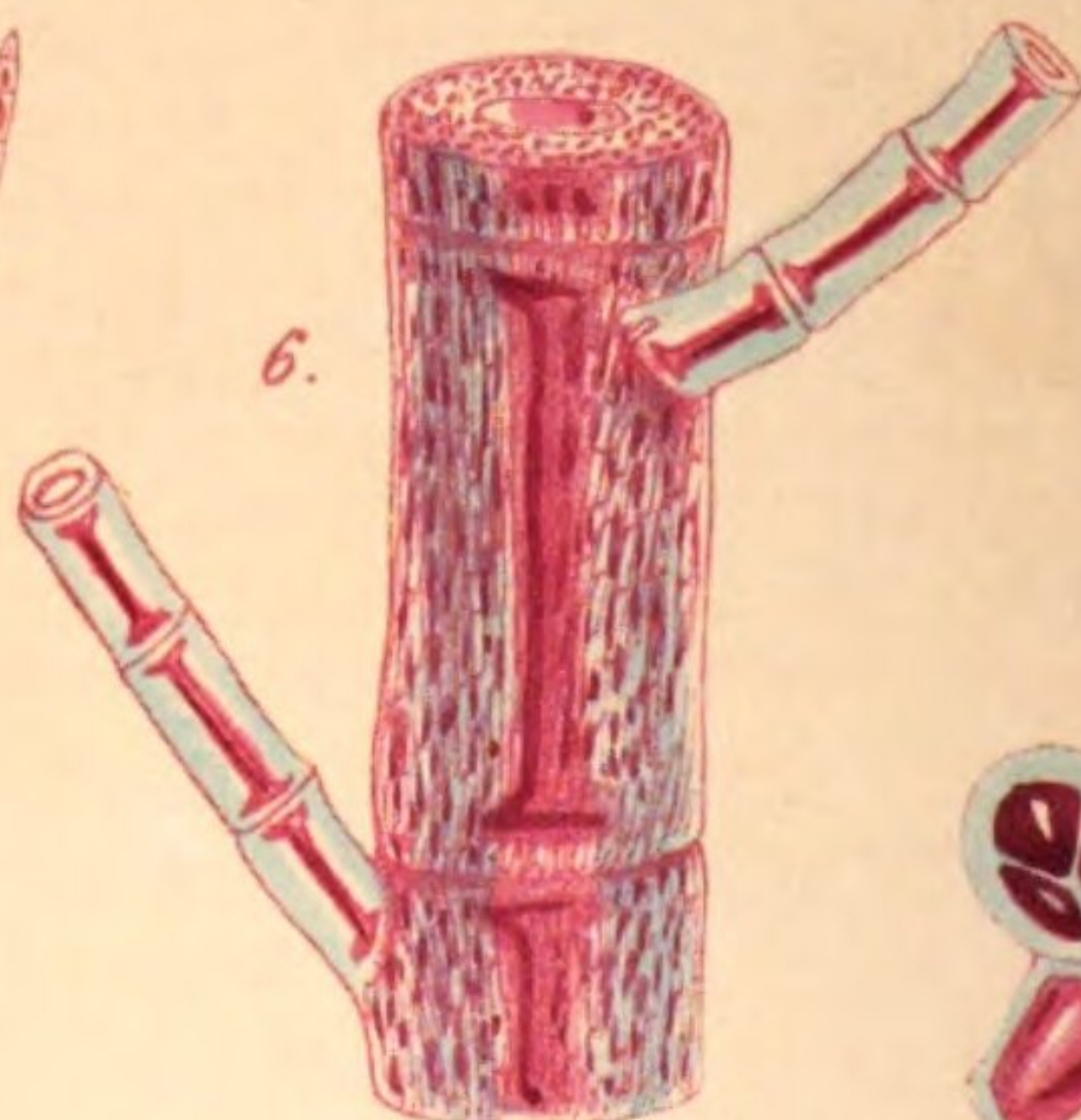
1.



2.



3.



6.



4.



5.

PLATE CCCXXXI.

CALLITHAMNION AFFINE, *Harv.*

GEN. CHAR. *Fronde* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants: 1, external *tetraspores*, scattered along the ultimate branchlets or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from *καλλος*, *beauty*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *affine*; much branched and bushy, the stem rather opaque, full of veins; secondary branches long, having a roundish outline, alternately plumulate; plumules very narrow, simply pinnate; pinnæ short, erect, increasing in length upwards, alternate, crowded at top; articulations of the branches three or four times, of the pinnæ once and a half as long as broad; tetraspores generally solitary, rising from the basal cell of the pinnæ.

CALLITHAMNION *affine*, *Harv. in Hook. Br. Fl.* vol. ii. p. 344. *Harv. Man.* ed. 1. p. 110. ed. 2. p. 180.

HAB. Parasitical on *Fuci*, between tide-marks. Annual. Summer. Shores of Bute, *Dr. Greville*.

GEOGR. DISTR.

DESCR. *Tufts* two to three inches high, with a somewhat pyramidal outline, the lower branches being longest, the upper gradually shorter. *Filaments* with a percurrent, nearly undivided stem, closely set, on all sides and throughout its whole length, with lateral branches. These are once or twice divided, and clothed with very narrow, elongate, erect, and slender, simply pinnated plumules, alternate, one rising from every joint of the branch. *Pinnules* short, erect, awl-shaped, the lowermost shortest and subdistant, the upper gradually longer and closer together, the terminal ones crowded and short. *Main* stem full of slender veins, and sub-opaque, its articulations twice or thrice as long as broad. *Articulations* of the branches thrice or four times as long as broad, with wide margins; those of the pinnules about once and a half as long as broad. *Tetraspores* globose, and mostly solitary, at or near the base of the pinnules. *Favellæ* in pairs, on slightly distorted branches, each favella occupying the place of a suppressed ramulus. *Colour* a deep red, pretty well preserved in drying. *Substance* membranaceous. In drying, the plant adheres closely to paper.

If this plant be really entitled to specific rank, it is well named *affine*, for it appears to be akin to several other species, and to form an intermediate link between them. To *C. Hookeri* it is allied in habit, and in the opacity of the main stem, but here the resemblance ends, for the nature of the ramification is extremely different. With *C. roseum* we may also compare it, but the narrow plumules, with short, erect pinnules, afford a clear mark of distinction. Perhaps, after all, the nearest approach is to *C. polyspermum*, which has plumules equally narrow, and pinnules equally short, and which grows in similar places; but the *solitary, basal* tetraspores of *C. affine* seem to point to another species. In making the foregoing contrasts, however, it must be borne in mind that I have compared *C. affine* only with the *normal* states of the species referred to, and no one who has studied the genus *Callithamnion* for any length of time, and in any considerable number of localities, needs to be told that there are many intermediate forms to which it is often difficult to assign the correct name. In the present instance the difficulty has been cut, rather than surmounted, by giving a name to one of these puzzling forms; but though this happened in 1832, no fortunate collector has since met with specimens which could fairly come under our *C. affine*.

Fig. 1. CALLITHAMNION AFFINE:—*the natural size*. 2. Part of a lesser branch, with its alternate plumules. 3. Branch bearing *favellæ*. 4. Branch with *tetraspores* on the ramuli. 5. A tetraspore on a ramulus. 6. Small portion of the main stem:—*all more or less highly magnified*.



PLATE LXXVII.

CALLITHAMNION TRIPINNATUM, *Ag.*

GEN. CHAR. *Frond* rosy or brownish red, filamentous; *stem* either opaque and cellular, or translucent and jointed; branches jointed, one tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches and containing numerous angular *spores*. CALLITHAMNION (*Lynbg.*),—from *καλλῖς*, *beautiful*, and *θαμνίον*, a *little shrub*.

CALLITHAMNION *tripinnatum*; frond distichously branched, capillary, decomposito-pinnate; plumules elongate, obovate, tripinnate above; upper pinnæ elongate, and pinnulate, lower short or abortive, each pinna having at its axil a minute pinnule; pinnules long, setaceous; joints of the stem 3–4 times, of the pinnæ about twice as long as broad; tetraspores oval, lateral on the axillary, and occasionally on the other pinnules.

CALLITHAMNION *tripinnatum*, *Ag. Sp. Alg.* vol. ii. p. 168. *J. Ag! Alg. Medit.* p. 72. *Endl. 3rd Suppl.* p. 34. no. 23 (but not of *Harv. in Hook. Br. Fl.* vol. ii. p. 346. nor of *Wyatt, Alg. Danm.* p. 186.).

MERTENSIA *tripinnata*, *Gratel. MS. sec. Ag.*

HAB. On marine rocks, at extreme low water mark. Annual. April, May. Very rare. Roundstone Bay, *Mr. Mc Calla*.

GEOGR. DISTR. Coast of France, *Grateloup*. Mediterranean Sea, *J. Agardh!* West of Ireland, very rare.

DESCR. *Fronde* tufted, from one to two inches high, capillary, membranaceous, not gelatinous, perfectly distichous, having a circumscribed, somewhat fan-shaped outline, about triply pinnate; the primary pinnæ, or *plumules* (one of which is represented at figure 2) having a narrow obovate outline, their lower pinnæ being very short, and simple, those approaching the middle of the rachis, gradually longer, those just beyond the middle longest, and those from thence to the apex gradually shorter. The upper and middle pinnæ have their upper half furnished with slender, setaceous, elongate, patent, alternate pinnules; their lower half naked, except the basal joint, which bears, almost invariably, at its upper side, or in the axil of the pinna, a solitary, and very frequently fertile, pinnule. Except for this basal pinnule, the lower pinnæ are quite naked, and generally very short or abortive. All the divisions are alternate. The joints of the stem and branches are pellucid, from three to four times longer than broad, cylindrical or somewhat swollen at the nodes; those of the pinnules are about twice as long as broad. *Tetraspores* oval, with wide borders, secund along the upper edge of the ultimate pinnules, very commonly on the axillary one. *Favellæ* unknown. *Colour* a full dark red. *Substance* delicate, and closely adhering to paper in drying.

Having, in the 'British Flora', committed the error of describing a variety of *C. thuyoides* under the name *C. tripinnatum*, an error unfortunately continued in Wyatt's admirable 'Algæ Danmonienses', I have peculiar satisfaction in affording to the British botanist a figure of the *true* plant, of which I am the more certain, having compared our Irish specimens with one communicated to me from the Mediterranean, by my friend Professor J. Agardh. Notwithstanding some slight differences, I cannot but regard the Irish plant as belonging to the same species as that from Cète. The latter is more luxuriant, rather more robust, and has the ultimate ramuli rather longer, and perhaps it is more irregularly branched than ours. But the *main* character,—that by which the species is chiefly distinguished,—of having a minute ramulus on the first joint of the pinnæ, is common to both.

Though the habit of *C. tripinnatum* is very like that of *C. gracillimum*, it will be perceived that its microscopic characters have a greater resemblance to those of *C. Borreri*, from which the axillary ramulus, and the distichous growth chiefly separate it.

Mr. Mc' Calla has, as yet, found very few specimens, and these accompanied *C. thuyoides*, growing on the perpendicular sides of steep rocks at the extreme limit of low water. No other British station has yet been observed, but it can hardly be doubted that it will yet be added to the Flora of Devonshire or Cornwall. Grateloup's specimens were probably collected on the opposite shores of the channel.

Fig. 1. CALLITHAMNION TRIPINNATUM:—*the natural size*. 2. A plumule or pinnated-branch. 3. One of the smaller pinnæ. 4. A pinnule, with *tetraspores*:—*all more or less highly magnified*.

Plate V.



PLATE V.

CALLITHAMNION GRACILLIMUM, *Ag.*

GEN. CHAR. *Frond* rosy, or brownish red, filamentous; *stem* either opaque and cellular or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit*: 1, external *tetraspores*, with colourless borders, scattered along the ultimate branchlets or borne on little pedicels; 2, roundish or lobed berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous seeds.

CALLITHAMNION *gracillimum*; *frond* distichously branched, fan-shaped; stems capillary, decomposito-pinnate; upper plumules long, narrow, ovate or lanceolate, spreading, bi-tri-pinnate; joints of the stem cylindrical, three or four times, of the pinnæ two or three times longer than broad, veinless; tetraspores borne on the tips of the pinnules.

CALLITHAMNION *gracillimum*, *Ag. Sp. Alg.* vol. ii. p. 168. *Harv. in Hook. Br. Fl.* vol. ii. p. 345. *Wyatt. Alg. Danm.* no. 45. *Endl. 3rd Suppl.* p. 34. *Kütz. Phyc. Gen.* p. 372.

HAB. Very rare. On mud-covered perpendicular rocks, near low-water mark. Annual. Summer. On the pier at Torquay, *Mrs. Griffiths*. Milford Haven, *Mr. Ralfs*. Falmouth, *Miss Warren*.

GEOGR. DISTR. Atlantic coast of France, *Grateloup*. South and west of England.

DESC. *Fronds* tufted, 1–4 inches high, exceedingly slender, distichous, irregularly branched; main branches rather few, simple, 1–2 inches long, unequally but closely plumulate along their whole length, having an ovate or lanceolate figure, and all attenuated at the point. Lower plumules short, vaguely pinnate; upper elongate, lanceolate, spreading, bi-tri-pinnate. All the divisions alternate, and a branchlet usually springing from every joint. The colour, when quite recent, is a deep red, becoming rose-red in fresh water, and if kept long in that medium the frond discharges a quantity of brilliant carmine powder, which permanently stains paper. Tetraspores very minute, elliptical, borne on the tips of shortened pinnulæ. *Favellæ* roundish or irregularly lobed, springing from the larger branches. Substance delicately membranaceous and flaccid, closely adhering to paper.

This extremely elegant plant, perhaps truly the *most graceful* of the very beautiful genus to which it belongs, was first gathered on the shores of France by M. Grateloup, who communicated specimens to the elder Agardh, by whom it was published in the year 1828. Shortly afterwards the indefatigable Mrs. Griffiths

discovered magnificent specimens growing along the mud-covered base of the harbour pier at Torquay, in which locality it may be found in more or less plenty every summer. More recently it has been found in Wales and Cornwall. From Mrs. Griffiths it received the very appropriate name of "*Fern-leaf*," aptly expressing the finely pinnated character of the branches, which do indeed closely resemble fairy ferns, so delicate that it is altogether impossible in a figure to do justice to their beauty. Our representation of the natural size must therefore be regarded as merely giving the general effect of a specimen held at arms length from the eye.

As a species, it is very closely related to *Cal. thuyoides*, with which it agrees in many characters, but from which it may be known by the greater proportionate length and breadth of the plumules, their more distichous arrangement and closer position; the shorter and more cylindrical joints of the main branches, and larger size of the frond. Both species agree in producing their *tetraspores* on the tips of the ultimate ramuli, a character by which they differ from all other British species with compound-pinnate fronds.

Fig. 1. *CALLITHAMNION GRACILLIMUM*:—*natural size*. 2. A plumule: *magnified*. 3. Ramulus with tetraspores. 4. Ramulus with a favella. 5. Portion of a favella ruptured, and discharging seeds. 6. Tetraspores removed and dissected:—all *more or less magnified*.



PLATE CCLXIX.

CALLITHAMNION THUYOIDEUM, *Ag.*

GEN. CHAR. *Fron*d rosy or brownish red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*), from κάλλος, *beauty*, and θαμνίον, *a little shrub*.

CALLITHAMNION *thuyoides*; stem capillary, undivided, set with alternate, distichous, repeatedly pinnate branches, with a narrow lanceolate outline; branches furnished with bipinnate or tripinnate plumules; articulations of the branches 2–6 times, of the pinnules about twice as long as broad; tetraspores borne on the tips of the ultimate pinnules.

CALLITHAMNION *thuyoides*, *Harv. in Hook. Br. Fl.* vol. ii. p. 346. *Harv. Man.* ed. 1. p. 111.

CALLITHAMNION *thuyoides*, *Ag. Sp. Alg.* vol. ii. p. 172. *Endl. 3rd. Suppl.* p. 34. *Kütz. Sp. Alg.* p. 645.

CALLITHAMNION *tripinnatum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 346 (*not of Agardh*). *Wyatt, Alg. Danm.* no. 186.

CONFERVA *thuyoides*, *E. Bot.* t. 2205.

HAB. On rocks, near low-water mark, rare. Annual. Spring and Summer. Yarmouth, *Mr. Borrer*. Plymouth, *Mr. Icona*, &c. Pier, Torquay, *Mrs. Griffiths*. Falmouth, *Miss Warren*. Ilfracombe; and Bracelet Bay, Swansea, *Mr. Ralfs*. Wicklow, *W.H.H.* Portaferry, *Mr. W. Thompson*. Roundstone, *Mr. McCalla*.

GEOGR. DISTR. British Islands, and Atlantic coast of France.

DESCR. *Root* a minute disc. *Fron*ds one to three inches long, densely tufted, perfectly distichous, with an ovate or flabellate outline. *Stem* mostly undivided, closely pinnated through its whole length with alternate, very patent branches, the lowest of which are longest, the rest gradually diminishing to the apex. These primary branches have a lanceolate outline, and are, with great regularity, pinnated with linear-lanceolate plumules, one rising from every articulation, and turned alternately to the right or left; the lowest plumules very short, the upper gradually longer and more compound, to the middle of the branch, thence gradually shortening towards its apex. *Plumules* bi-tripinnate, resembling the branches in miniature; the first plumule always given off from the upper side of the rachis. *Articulations* of the stem and branches very variable in length, commonly from four to six times as long as broad; but sometimes very short, with

swollen dissepiments :—those of the ramuli uniformly about twice as long as broad. *Favellæ* solitary or binate, bursting from the rachis of the plumules, variously lobed. *Tetraspores* minute, globose, terminal on the ultimate ramuli. *Colour* a rosy pink, or brownish red. *Substance* delicately membranaceous, soft and flaccid, most closely adhering to paper.

One of the most *concinna* of the *Callithamnia*, elegant in all its minute parts, and strictly neat in its mode of growth. In essential character it closely approaches *C. gracillimum*, from which it is more to be distinguished by habit than by any very definite character. *C. gracillimum* is a larger and more tufted plant, more irregular in ramification, with longer and more indefinite plumules, varying much in the composition of its ramuli. Our present plant is rather robust, with an evident central stem and lateral branches, spreading with much regularity; each branch, as well as the plumules with which it is feathered, being of a narrow lanceolate outline. The plumules are very generally triply pinnate. *Favellæ* are much less commonly found on this species than tetraspores, and generally burst from the sides, and not the apex of a branchlet.

Though found in many places, *C. thuyoideum* must be ranked among the rarer forms of the genus.

Fig. 1. *CALLITHAMNION THUYOIDEUM*; a frond :—of the natural size. 2. Two articulations from a branch, each bearing a plumule. 3. Pinna from the same, with tetraspores. 4. A tetraspore. 5. Abbreviated plumule bearing a favella :—all more or less highly magnified.



CALLITHAMNION CORYMBOSUM, *Ag.*

PLATE CCLXXII.

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants: 1, external *tetraspores* scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from *καλλος*, *beauty*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *corymbosum*; frond setaceous at the base, capillary and byssoid above, flaccid, gelatinous, excessively branched; secondary branches alternate, repeatedly dichotomous, subflabelliform, level-topped; ramuli many times forked, with patent axils; apices obtuse; articulations of the branches from eight to ten times as long as broad; tetraspores solitary, opposite the axils of the terminal forks, sessile, globose; favellæ binate, on truncated branches.

CALLITHAMNION *corymbosum*, *Ag. Sp. Alg.* vol. ii. p. 165. *Harv. in Hook. Br. Fl.* vol. ii. p. 346. *Harv. in Mack. Fl. Hib.* part 3. p. 216. *Harv. Man.* p. 112. *Wyatt, Alg. Danm.* no. 92.

CALLITHAMNION *versicolor*, *Ag. Sp. Alg.* vol. ii. p. 170. *Harv. in Hook. Br. Fl.* vol. ii. p. 346. *Harv. in Mack. Fl. Hib.* vol. ii. p. 165. *Harv. Man.* p. 112.

PHLEBOTHAMNION *corymbosum*, *Kütz. Phyc. Un.* p. 375. *Sp. Alg.* p. 657.

PHLEBOTHAMNION *versicolor*, *Kütz. Phyc. Un.* p. 375. *Sp. Alg.* p. 657.

CERAMIIUM *corymbosum*, *Ag. Syn.* p. xxvii. *Ag. Syst.* p. 138.

CERAMIIUM *versicolor*, *Ag. Syst.* p. 140.

CONFERVA *corymbosa*, *Eng. Bot.* t. 2352 (articulations too short).

HAB. On the leaves of *Zostera*, the fronds of various *Algæ*, and attached to rocks and stones, near low-water mark. Annual. Summer. Not uncommon, from Orkney to Cornwall.

GEOGR. DISTR. Atlantic and Mediterranean coasts of Europe. East coast of North America.

DESCR. *Root* minute, giving rise to a dense tuft, composed of numerous fronds. *Stem* one to three inches long, the smaller specimens more slender than human hair, the larger as thick as hog's bristles at base, soon attenuated and reduced to a byssoid fineness in the upper part of the plant, variable in ramification; sometimes dichotomous from the very base, with no trace of a leading stem; sometimes (and more frequently) having a leading, subsimple stem set with closely placed, alternate branches. These branches, in full-grown plants, are excessively divided, having an ovate or fan-shaped

outline, the branching being partly alternate, and partly dichotomous. The ultimate divisions, or ramuli, are more regularly forked, and level-topped, giving the tuft the appearance of being composed of innumerable minute corymbs, clothing the branches. *Articulations* of great length in all the main branches, destitute of veins, except towards the base of the stem and in very old fronds; those of the ultimate ramuli from three to four times as long as broad; all having a wide pellucid border surrounding the endochrome. *Favellæ* generally in pairs, terminating the secondary branches, and sometimes surrounded by a few forked ramuli. *Tetraspores* solitary, sessile, placed just below the forkings of the ultimate ramuli. *Colour* a fine rosy red, sometimes brownish, soon changing to orange in fresh water. *Substance* exceedingly tender, flaccid, and gelatinous, adhering most closely to paper in drying.

A very variable plant: so much so, that most authors regard as distinct species two forms which I here bring together. Hitherto in British works we have recognized the original *Cal. corymbosum* of Eng. Bot., and the *Cal. versicolor* of Agardh, the differences between which are said to be, that the former is much more slender than the latter, with longer joints, a less evident stem, and a less pinnated branching. Some specimens are, indeed, very slender, and dichotomously divided, and others are robust, with an undivided stem and lateral branches; but between the most extreme forms I have seen too many intermediate states to admit of my regarding them as belonging to more than one specific type. I have examined several authentic specimens of Agardh's *C. versicolor* and compared them with our British plant so called, and can detect no differences between them. I therefore no longer hesitate to unite that synonyme to *Cal. corymbosum*.

The nearest affinity of the present plant is with *C. spongiosum*, a species much more densely branched and bushy, of a browner colour, with a very robust stem and very short articulations; but, like the present, remarkable for dichotomous, level-topped ramuli, and tetraspores placed opposite the alternate forkings.

Fig. 1. CALLITHAMNION CORYMBOSUM, on a piece of *Zostera* leaf:—*the natural size.* 2. One of the ultimate forked branchlets, and some articulations of a secondary branch. 3. Ramuli with tetraspores. 4. A branch with favellæ. 5. The favellæ removed. 6. Ramulus with (so called) *antheridia*. 7. Veiny articulations from the base of the stem:—*all magnified.*



PLATE CXXV.

CALLITHAMNION SPONGIOSUM, *Harv.*

GEN. CHAR. *Fronde* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from *καλῆς*, *beautiful*, and *θαμνίον*, a *little shrub*.

CALLITHAMNION *spongiosum*; stems robust, cartilaginous, more or less opaque and veiny, branched in every direction; branches thickly set with dense, quadrifarious, repeatedly dichotomous, round-topped branchlets; axils patent; apices short, bifid; articulations of the branches swollen at the joints, twice or thrice as long as broad.

CALLITHAMNION *spongiosum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 346. *Harv. in Mack. Fl. Hib.* part 3. p. 217. *Harv. Man.* p. 113. *Wyatt, Alg. Danm.* no. 93. *Crouan, in Dezm. Pl.*

HAB. On perpendicular submarine rocks, near low-water mark, and parasitically on other Algæ. Annual. Summer. Dunleary (1802), *Mr. Templeton*. Larne, *Dr. Drummond*. Torquay, *Mrs. Griffiths*. Kingstown Harbour and Killiney, *W.H.H.* Salcombe, *Mrs. Wyatt*. Plymouth, *Rev. W. S. Hore and Mr. Rohloff*. Land's End and Ilfracombe, *Mr. Ralfs*. Jersey, *Miss White*. Saltcoats, and Largo, Fife, *Rev. D. Landsborough*. Kilbride, *Major Martin*. Falmouth, *Miss Warren*.

GEOGR. DISTR. British Islands, and Atlantic shores of France.

DESCR. *Fronde* tufted, two to four inches high, with a conical outline, flaccid, soft, holding water like a sponge. *Stems* thicker than bristle, more or less opaque and veiny, branched in every direction, and thickly clothed with short ramuli. *Branches* long, sparingly divided, but very densely clothed with quadrifarious secondary branches, the lowermost of which are longest, the rest gradually shorter upwards; these are, in luxuriant specimens, furnished with a second or third series, the penultimate ones being linear-obovate and round-topped in outline, and densely set throughout their length with short, dichotomous ramuli. *Ramuli* repeatedly dichotomous, with patent axils, forking at every joint; apices short, bifid and very obtuse. *Tetraspores* elliptical, solitary, sessile in the forkings of the ramuli, triparted. *Favellæ* large, and generally bi-lobed, the lobes roundish, placed at the summits of abbreviated branches, frequently surrounded by two or three dichotomous ramuli. *Substance* flaccid, membranaceous, but not gelatinous, destitute of gloss when dry. *Colour* a dull purplish- or brownish-red. *Articulations* of the main stems more or less filled with longitudinal veins; those of the branches and branchlets with a very narrow coloured tube, surrounded

by a broad transparent border; the joints more or less swollen; all pretty uniformly twice or thrice as long as broad, those of the stem occasionally somewhat longer. In some specimens the place of tetraspores is occupied by roundish bodies (fig. 7.), composed of exceedingly minute, dichotomous filaments, radiating from a central point: these may either be regarded as viviparous tetraspores, or, possibly, as antheridia.

This species was originally detected in the year 1802, by the late Mr. Templeton, of Belfast, at the station where, thirty years later, I gathered it, without being at the time aware of the previous discovery. Of recent years it has been found on so many different parts of the coast, that it must be regarded as one of our commoner species; but it does not appear to be generally diffused, not having yet been noticed in the west of Ireland, although frequent on some parts of the eastern shores. The finest specimens I have seen are those collected by Messrs. Hore and Rohloff, in Plymouth Sound; a locality which seems peculiarly favourable to the growth of *Callithamnion*.

Callithamnion spongiosum has much the external appearance of *C. Arbuscula*; but its microscopic characters are so different, that they belong to separate sections of the genus. It is much more nearly allied to *C. corymbosum*, or the exotic *C. granulatum*; a south of Europe species, which has so much in common with it, that I shall not be surprised if future observations lead to their being united. My specimens of that plant are, however, not sufficiently perfect to enable me at present to decide the question. From *C. corymbosum*, the duller colour, shorter joints, more robust and opaque stems, and dense, spongy habit, sufficiently distinguish it. It is curious that it appears to occupy the place of *C. Arbuscula*, on shores where the latter is not found, these plants never growing together, though both affect similar situations on different shores.

Fig. 1. CALLITHAMNION SPONGIOSUM: a tuft:—of the natural size. 2. A secondary or tertiary branch. 3. A branchlet truncated and bearing favellæ. 4. Spores. 5. A ramulus, with tetraspores. 6. A tetraspore, *in situ*:—more highly magnified. 7. Viviparous tetraspores?

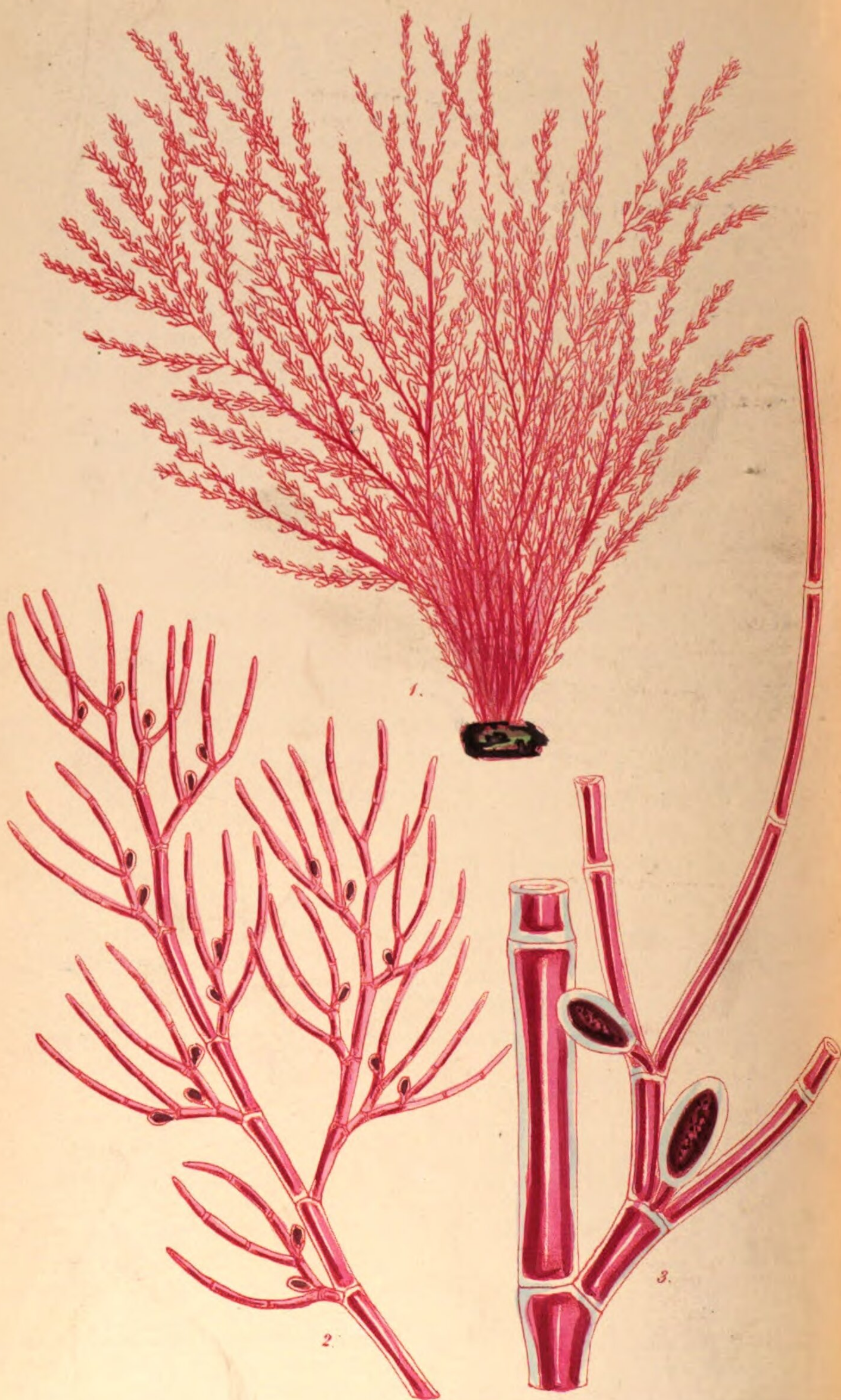


PLATE CCXII.

CALLITHAMNION PEDICELLATUM, *Ag.*

GEN. CHAR. *Fronde* rosy or brownish-red, filamentous, stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external tetraspores, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*), seated on the main branches, and containing numerous, angular spores. CALLITHAMNION (*Lyngb.*),—from *καλος*, *beautiful*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *pedicellatum*; stems setaceous, pellucid, jointed, loosely and irregularly divided; branches furnished with short, alternate, sparingly dichotomous ramuli; apices very obtuse; articulations variable, mostly very long; tetraspores(?) solitary, elliptical or pear-shaped, axillary, stalked.

CALLITHAMNION *pedicellatum*, *Ag. Sp. Alg.* vol. ii. p. 174. *Harv. in Hook. Fl. Brit.* vol. ii. p. 347. *Harv. in Mack. Fl. Hib.* part 3. p. 217. *Harv. Man.* p. 114. *Wyatt, Alg. Damn.* no. 94. *J. Ag. Alg. Medit.* p. 73. *Kütz. Phyc. Gen.* p. 371. *Endl. 3rd. Supp.* p. 34.

CALLITHAMNION *clavatum*, *Ag. Sp. Alg.* vol. ii. p. 180. *J. Ag. Alg. Medit.* p. 73. *Kütz. Phyc. Gen.* p. 371. *Mont. An. Sc. Nat.* 1839. p. 166. *Endl. 3rd, Supp.* p. 34.

CALLITHAMNION *Perreymondii*, *Duby. Mem.* vol. ii. t. 4. f. 5.

CALLITHAMNION *botryticum*, *De Not.* (fide *Lenorm.*)

GRIFFITHSIA *irregularis*, *Kütz. Actien*, 1836.

CERAMIUM *pedicellatum*, *Ag. Syst.* p. 137.

CERAMIUM *clavægerum*, *Bonn. Hyd. loc. in An. Mus. Par.* 1825. p. 90.

CONFERVA *pedicellata*, *E. Bot.* t. 1817. *Dillw. Conf.* t. 108.

HAB. On rocks and wood-work, near low-water mark, mostly in deep rock-pools; sometimes dredged in from 4–7 fathoms. Rather rare, but found all round the coast. Annual. Summer. Brighton, *Mr. Borrer*. Torbay &c., *Mrs. Griffiths*. Sidmouth, *Miss Cutler*. Falmouth Bay, *Miss Warren*. Salcombe, Carnarvon, and Milford Harbour, *Mr. Ralfs*. Jersey, *Miss White* and *Miss Turner*. Bantry Bay, *Miss Hutchins*. Malbay, Valentia, and Wicklow, *W.H.H.* Portaferry and Bangor, Belfast Bay, *Mr. W. Thompson*. Roundstone, *Mr. M'Calla*. Ferriter's Cove, *Mr. W. Andrews*. Howth, *Miss Gower*. Orkney, *Rev. J. Pollexfen*. Dredged in Calf Sound, in seven fathoms, *Messrs. Thomas and M' Bain*. Saltcoats and Ardrossan (on the pier), *Rev. D. Landsborough*.

GEOGR. DISTR. Atlantic shores of France. Mediterranean Sea.

DESCR. *Root* discoid, or somewhat fibrous. *Fronde* densely tufted, from two to six or eight inches high, as thick as hogs' bristles, irregularly divided in a manner between alternate and dichotomous; branches sometimes nearly simple, long and virgate, sometimes repeatedly branched, and somewhat flabellate, more or less fastigate, seldom quite naked, generally furnished at each joint with short, forked, or twice or thrice dichotomous, alternate ramuli. Ultimate divisions of the forked ramuli often incurved, cylindrical,

of several joints, very obtuse. *Stems* articulated at the base, the articulations free of veins, with a wide limb and a more or less contracted endochrome, the dissepiments pellucid. *Articulations* variable in different specimens, sometimes only three or four times longer than broad, but more commonly ten or twelve times. *Tetraspores* (?) elliptical or pear-shaped, dark-coloured, with a wide border, and containing a dense, undivided mass of endochrome. These bodies are borne on short pedicels, consisting of a single cell, in the axils of the ultimate ramuli; each fructification being formed out of the central *bud* of a trifid branch, and thus cymose. *Favellæ* unknown. *Substance*, when freshly gathered, somewhat crisp; soon becoming flaccid. *Colour*, a clear pinky red, rapidly changing in fresh water, and becoming brownish in drying, often staining the paper brown. It closely adheres to paper in drying.

Originally discovered on the Sussex coast, by Mr. Borrer, and long considered a rarity, this beautiful plant has now been found to grow in so many places that I might perhaps have spared myself the transcription of the various habitats mentioned above, and substituted the statement that it is not very uncommon, and is generally distributed round the British coasts. I have not seen any specimens from the east of England, and it is certainly rare in the north, and in Scotland. On the south coast of England, and south and west of Ireland it is by no means rare, and the individual specimens are often of large size. It is common on the shores of France, and in the Mediterranean, where its different varieties, as I regard them, are ennobled to the rank of species by most continental botanists.

M. Montagne in a memoir on *Cal. clavatum*, published in the Annales des Sciences Naturelles, refers the *Conf. pedicellata* of Dillwyn to that species, retaining, of course, the name *pedicellatum* to the plant described in Eng. Botany, and which he regards as a different species. I possess fragments of Mr. Borrer's original specimen figured in English Botany; and have examined those collected by Miss Hutchins from which Dillwyn's plate, copied from a beautiful drawing by that lady, was engraved; and having compared these together, and contrasted them with a great number of specimens from various localities, I am not disposed to alter the opinion which I formerly expressed of their identity. M. Montagne is, no doubt, correct in referring Dillwyn's plant to the *C. clavatum* of Agardh.

Among the many forms which this plant puts on, I possess one gathered by Mr. Ralfs at Salcombe, which is remarkable for extremely squarrose ramuli and spreading branches.

Fig. 1. CALLITHAMNION PEDICELLATUM; tuft:— of the natural size. 2. Apex of a branch, with ramuli. 3. Portion of branch, ramulus and fruit:—both magnified.

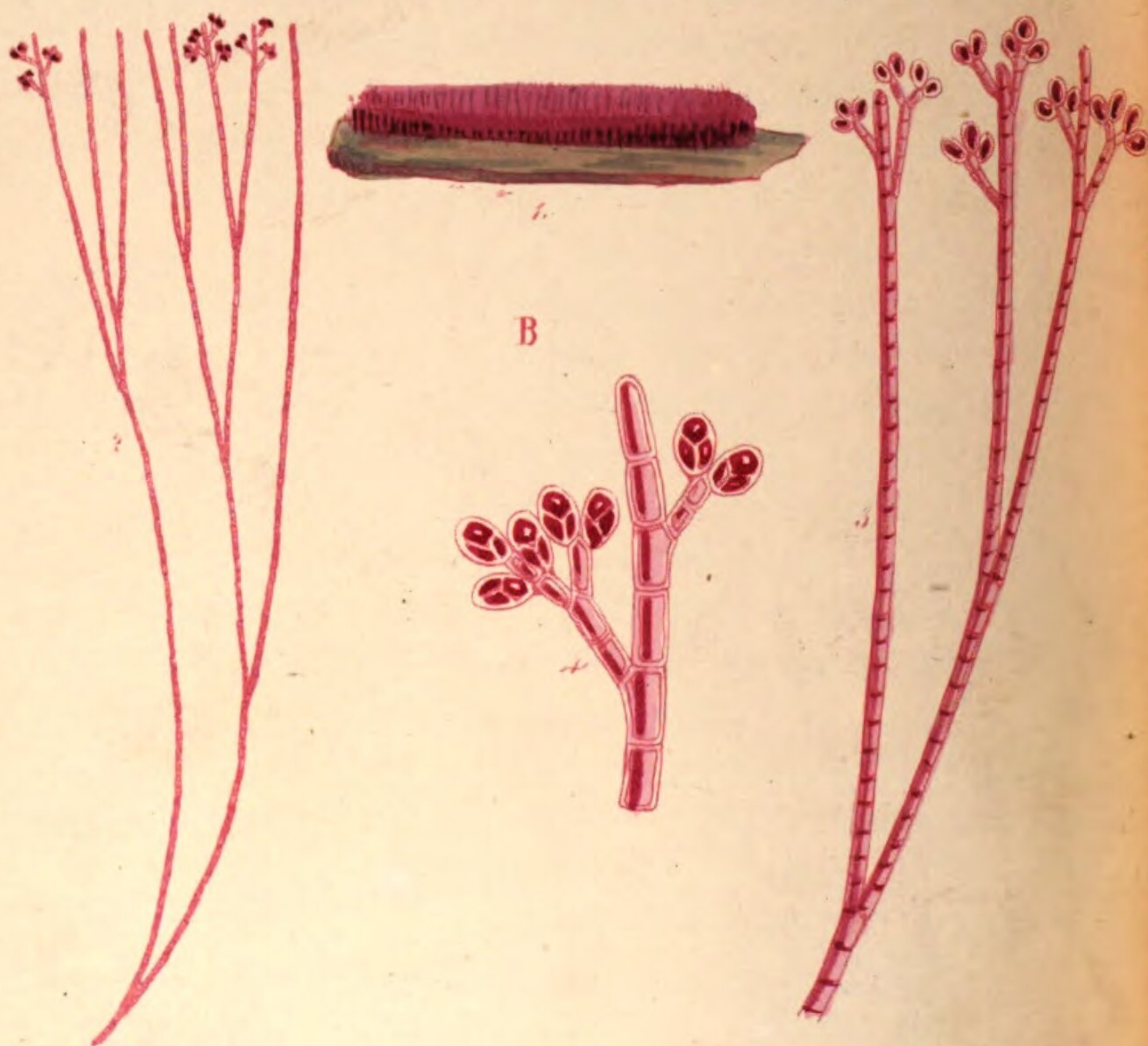


PLATE CXX. A.

CALLITHAMNION FLORIDULUM, *Ag.*

GEN. CHAR. *Fronde* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants; 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from *καλλίς*, *beautiful*, and *θαμνίον*, a *little shrub*.

CALLITHAMNION *floridulum*; tufts very dense, more or less globose, fastigiate; filaments slender, dichotomous or alternately branched, the branches few, very erect or appressed, long, simple, straight; articulations thrice as long as broad, cylindrical; tetraspores oval, borne on very short, erect pedicels ranged in a secund manner, along the upper branches.

CALLITHAMNION *floridulum*, *Ag. Sp. Alg.* vol. ii. p. 188. *Harv. in Hook. Br. Fl.* vol. ii. p. 348. *Harv. Man.* p. 116. *Wyatt, Alg. Danm.* no. 219. *Kütz. Phyc. Gen.* p. 371.

TRENTEPOHLIA *floridula*, *Harv. in Mack. Fl. Hib.* part 3. p. 218.

CONFERVA *floridula*, *Dillw. Conf. Suppl.* t. F.

HAB. On sand-covered rocks, near low-water mark, at all seasons. Perennial? March and April. Abundant on the Galway coast, where it was first observed by *Mr. J. T. Mackay*. Also on the Clare and Kerry coasts, and on the east coast of Ireland. Antrim, *Dr. Scott*. Orkney, *Rev. J. H. Pollexfen*. Land's End, *Mr. Ralfs*.

GEOGR. DISTR. Coast of France.

DESCR. *Filaments* of equal diameter throughout, very slender, silky, closely packed together in dense, more or less fastigiate, roundish tufts, dichotomously or irregularly branched; branches few, long, erect, and very straight, the lower ones longest, the rest gradually shorter. *Ramuli* few or none, closely pressed to the branches. *Tetraspores* oval, on short pedicels, secundly disposed along the branches. *Joints* fully thrice as long as broad. *Colour* dull pink, becoming more or less purple in drying, the bases frequently fading to a dull green. *Substance* membranaceous imperfectly adhering to paper.

An exceedingly abundant species on the west coast of Ireland, covering a large extent of rock with its hemispherical, densely matted and aggregated cushions. At the close of summer great quantities of these, which are called *figs* by the country people, are washed on shore, and collected as manure, though inferior in strength to many other marine plants.

The fructification was discovered by *Mr. Ralfs*, in the year 1840.

Fig. A. CALLITHAMNION FLORIDULUM:—of the natural size. 2. Portion of a filament. 3. Apex of a branch in fruit. 4. Section of a branch, with tetraspores:—all more or less magnified.

CALLITHAMNION ROTHII, *Lyngb.*

CALLITHAMNION *Rothii*; widely spreading, densely tufted; filaments very slender, short, erect, dichotomous or irregularly branched; branches long, straight, appressed; articulations twice as long as broad; tetraspores clustered, borne on short, subterminal, corymbose ramuli.

CALLITHAMNION *Rothii*, *Lyngb. Hyd. Dan.* p. 129. t. 41. *Ag. Syst. Alg.* vol. ii. p. 185. *Harv. in Hook. Br. Fl.* vol. ii. p. 347. *Harv. Man.* p. 116. *Wyatt, Alg. Danm.* no. 188. *Endl. 3rd Suppl.* p. 34. *Kütz. Phyc. Gen.* p. 471.

CERAMIIUM *Rothii*, *Berk. Gl. Br. Alg.* t. 20.

TRENTEPOHLIA *Rothii*, *Harv. in Mack. Fl. Hib.* part 3. p. 218.

CONFERRA *Rothii*, *Linn. Syst. Nat.* vol. vi. p. 1806. *Dillw. Conf.* t. 73. *E. Bot.* t. 1702. *Jurg. Alg. Dec.* no. 10.

CONFERRA *violacea*, *Roth. Cat. Bot.* vol. i. p. 190. t. 4. f. 1. *Fl. Germ.* v. iii. part 1. p. 525.

β. purpurea; filaments very minute, forming continuous velvety patches, slightly branched.

CALLITHAMNION *purpureum*, *Harv. Man.* p. 116.

TRENTEPOHLIA *purpurea*, *Ag. Syst.* p. 36. *Harv. in Hook. Br. Fl.* vol. ii. p. 382. *Harv. in Mack. Fl. Hib.* part 3. p. 218.

BYSSUS *purpurea*, *E. Bot.* t. 192.

CONFERRA *purpurea*, *Dillw.* t. 43.

HAB. Spreading over the surface of rocks, about half-tide level. *β.* on maritime rocks, within the influence of the spray, but beyond the reach of ordinary tides. Perennial. Winter.

GEOGR. DISTR. Atlantic shores of Europe. Baltic Sea. East coast of North America.

DESCR. *Filaments* from a line to half an inch in height, very slender, densely packed together in extensive velvety patches, of a deep red or purplish red colour. *Branches* few, simple, and very erect, the lowest longest, generally bare of ramuli. *Tetraspores* two to four, or frequently three together, on short pedicels, growing from the uppermost joints of the branches. *Joints* twice as long as broad. *Substance* membranaceous, more or less perfectly adhering to paper.

A smaller and more slender plant than the preceding, with shorter joints, and well characterized by the difference in fructification. I have ventured, I trust not without sufficient warrant, to unite to *C. Rothii* the old *Conferva* or *Byssus purpurea*, which I have long regarded as a stunted form, whose characters depend on the situation in which it is found growing. In this opinion I am supported by Mr. Ralfs, an accurate and close observer, who has had the best opportunities of investigating the subject.

Fig. B. CALLITHAMNION ROTHII:—of the natural size. 2. Portion of a filament. 3. Apex of a branch in fruit. 4. Section of a branch with clusters of tetraspores:—all more or less magnified.

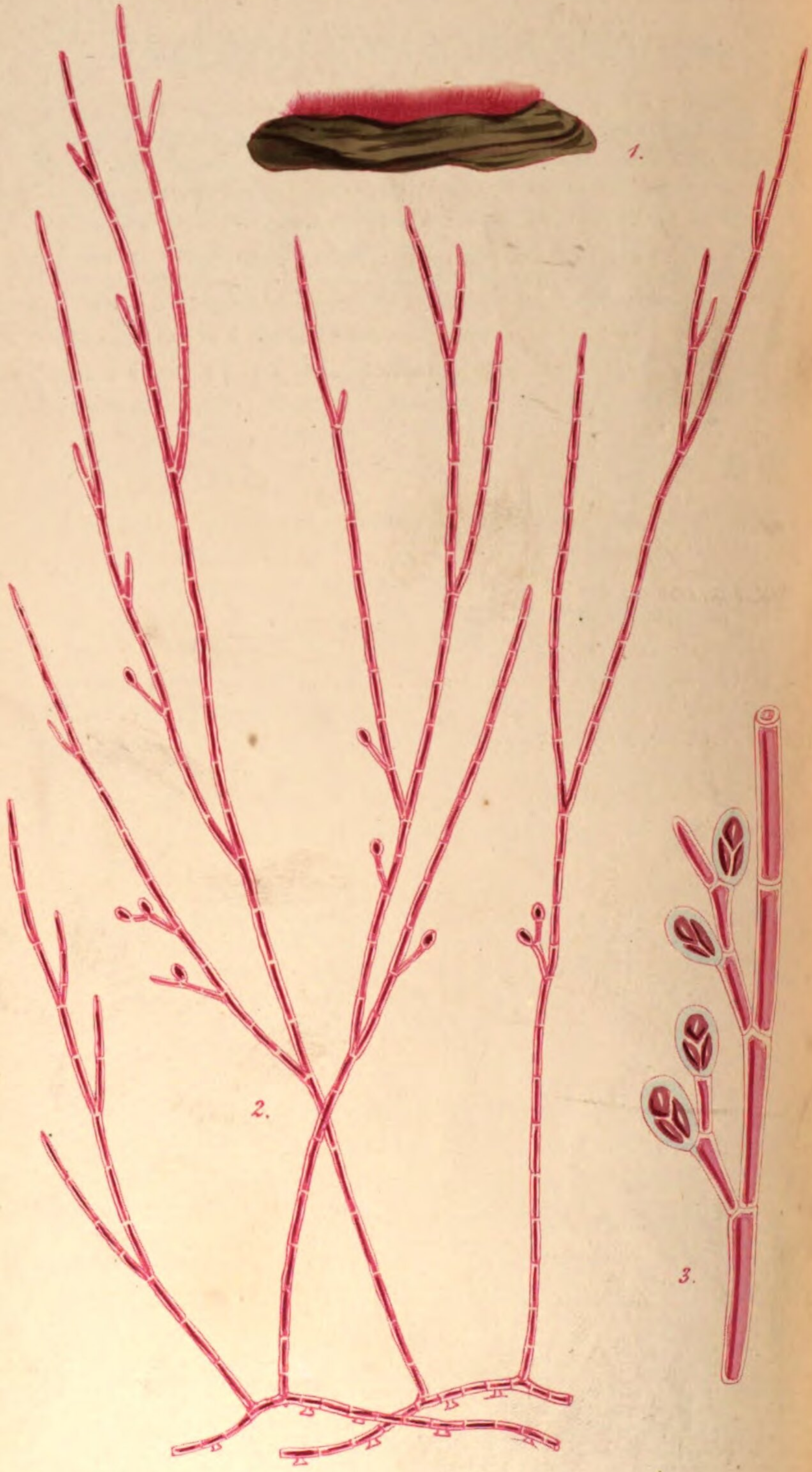


PLATE CCCXXV.

CALLITHAMNION MESOCARPUM, *Carm.*

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants: 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from *καλλος*, *beauty*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *mesocarpum*; stems rising from creeping filaments, erect, simple or sparingly branched; branches alternate, very erect, naked, or having a few, scattered, erect ramuli; articulations four or five times as long as broad; tetraspores elliptical, on long, simple or forked, lateral pedicels.

CALLITHAMNION *mesocarpum*, *Carm. Alg. Appin. MSS.* *Harv. in Hook. Br. Fl.* vol. ii. p. 348. *Harv. Man.* ed. 1. p. 116. ed. 2. p. 184. *Kütz. Sp. Alg.* p. 642.

HAB. On rocks at the extremity of low-water mark, very rare. Appin, *Capt. Carmichael*.

GEOGR. DISTR.

DESCR. “*Tufts* continuous, forming a broad, shaggy, purple crust.” *Carm.* *Stems* from an eighth to a quarter inch or rather more in height, springing from decumbent filaments, which are attached to the surface of the rock by little rootlets, erect, simple or having two or three alternate or secund branches. *Branches* issuing at very acute angles, erect, virgate, either quite naked or furnished with a few, distant, erect, scattered, few-jointed ramuli. *Articulations* four or five times as long as broad, with wide borders. *Tetraspores* elliptical, borne on the tips of the lateral ramuli, which are generally one-jointed and either simple or forked, in which case, one arm of the fork is converted into a tetraspore. *Favellæ* unknown. *Colour* a full deep lake. *Substance* membranaceous, adhering to paper in drying.

Capt. Carmichael, in describing this plant, says, “I could not discover that it sprang from creeping filaments;”—a remark which induced me formerly to place it in the section with *C. Rothii* and *C. floridulum*. But on recently inspecting Capt.

Carmichael's original specimens, in the Hookerian Herbarium, I clearly made out the existence of a creeping *rhizome* from which the erect stems spring, and this species should therefore be removed to the section of *C. Turneri* and *C. pluma*. It comes so close, indeed, to some states of *C. Turneri*, particularly to those varieties constituting *C. repens* of authors, that it may fairly be questioned whether *C. mesocarpum* should not be erased altogether from the list of species, and referred as a synonym to *C. Turneri*. Capt. Carmichael's specimen is mixed with fronds of *C. pluma*. This is curious, as both were found growing on bare rocks, and *C. pluma* is well known to prefer the stems of *Laminariæ*.

The figure here given has been prepared from authentic specimens in Herb. Hook. The upper figure (fig. 1) is, of course, imaginary; the specimens examined being merely a few fronds, partly preserved on talc, and partly on paper.

Fig. 1. Tuft of *CALLITHAMNION MESOCARPUM*:—*the natural size*. 2. Some of the fronds:—*magnified*. 3. Portion of a branch with tetraspores:—*highly magnified*.

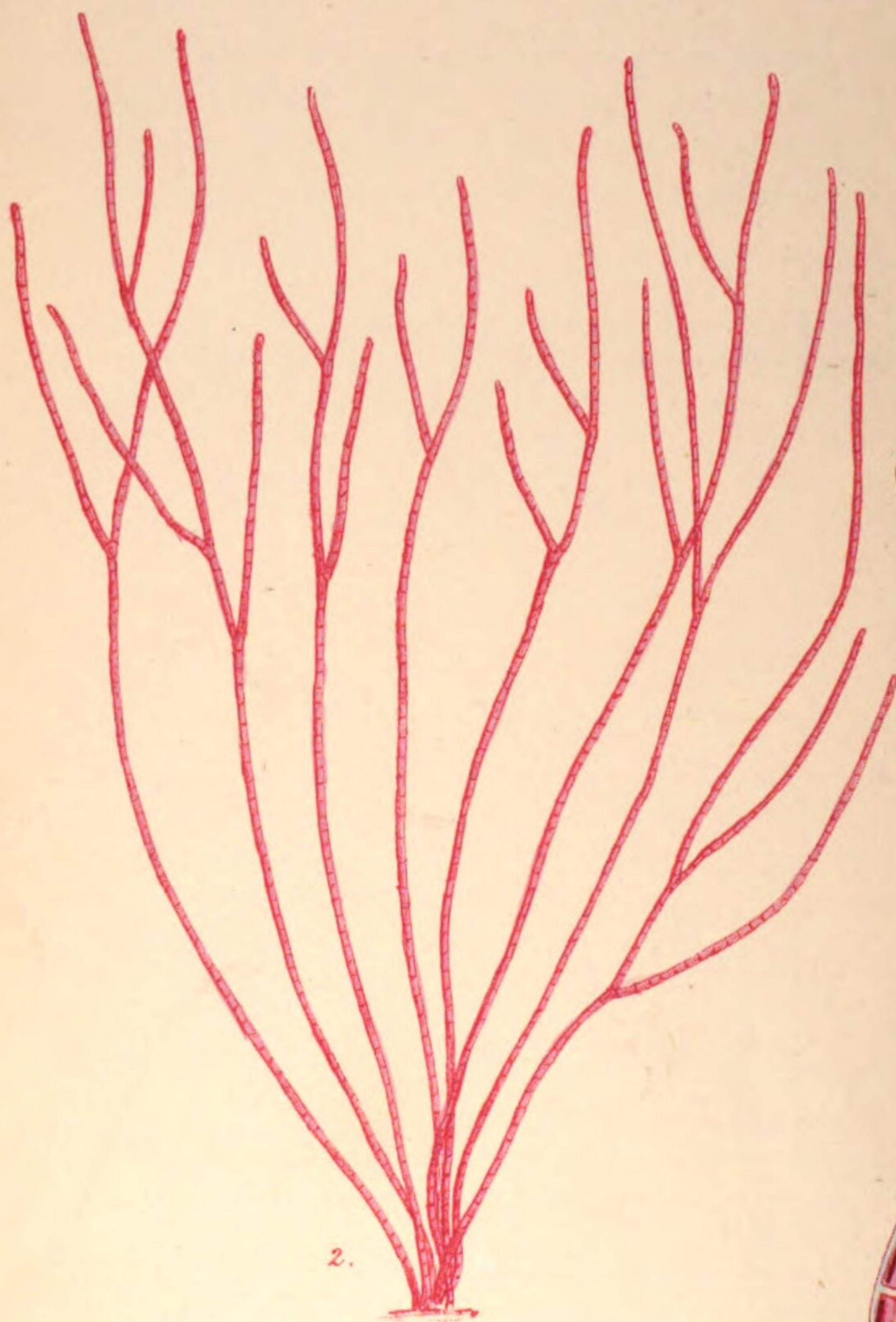
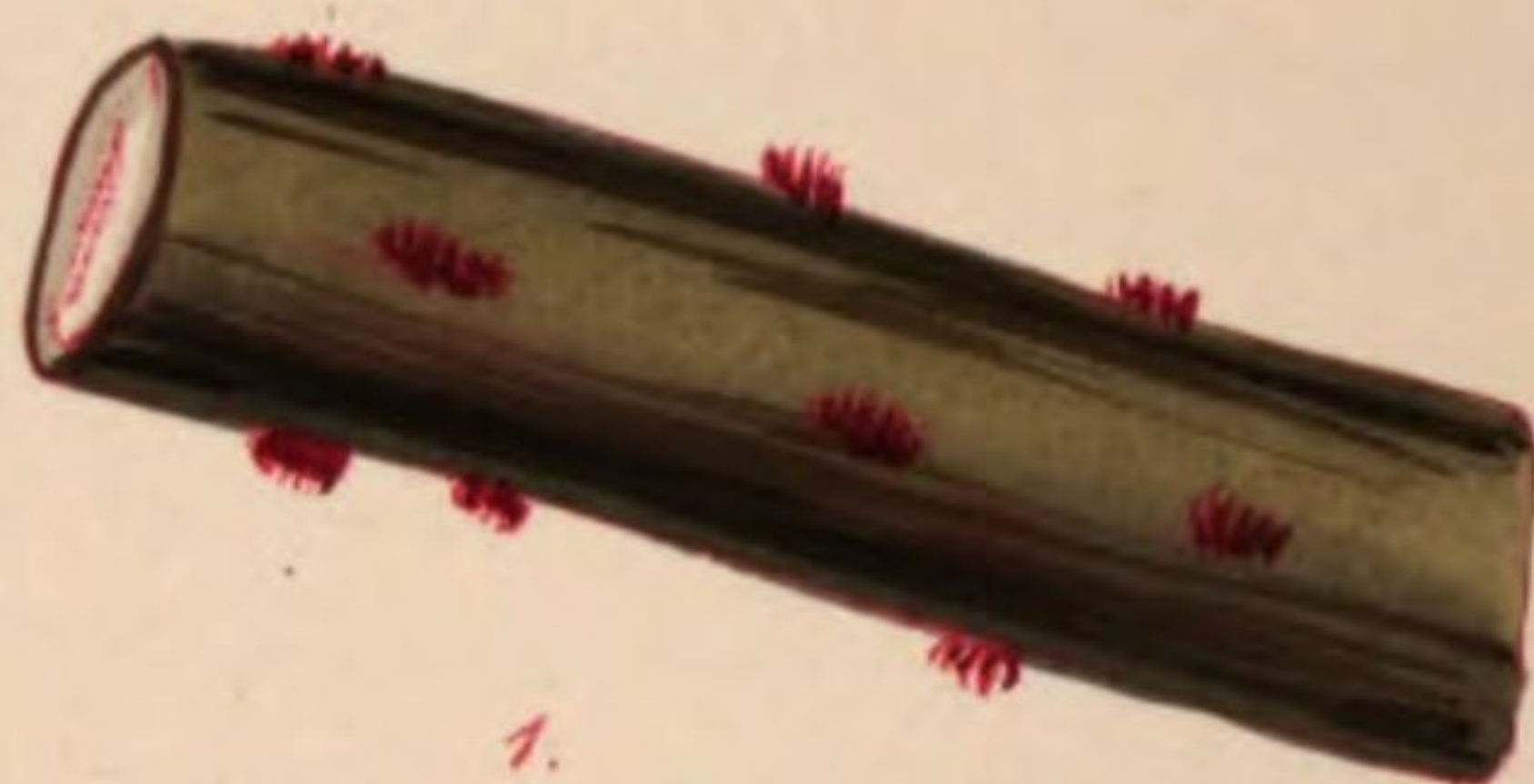


PLATE CCXCVII.

CALLITHAMNION SPARSUM, *Harv.*

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds on distinct plants: 1, external *tetraspores* scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like *receptacles* (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*), —from *καλλος*, *beauty*, and *θαμνιον*, a *little shrub*.

CALLITHAMNION *sparsum*; parasitical, minute; filaments tufted, scattered, sparingly branched; branches spreading, unequal; articulations twice or thrice as long as broad; tetraspores "obovate, sessile, mostly axillary." (*Carm.*)

CALLITHAMNION *sparsum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 348. *Harv. Man.* ed. 2. p. 184. *Kütz. Sp. Alg.* p. 643.

CALLITHAMNION *floridulum*, *Lyngb. Hyd. Dan.* p. 130. t. 41. (*not of Phyc. Brit.*)

TRENTEPOHLIA *sparsa*, *Harv. in Mack. Fl. Hib.* part 3. p. 219.

HAB. On old stems of *Laminaria saccharina* at Appin, *Capt. Carmichael*.
On *Cladophora rupestris* at Miltown Malbay, *W.H.H.*

GEOGR. DISTR. Shores of Greenland, *Gieseke*.

DESCR. *Fronds* forming small, scattered tufts, one or two lines in height and as much in diameter, composed of erect, closely-set filaments. *Filaments* nearly simple, or furnished with two or three simple, alternate or secund branches, equalling the main filament in diameter, cylindrical, obtuse. *Articulations* about once and a half as long as broad, with pellucid dissepiments. *Tetraspores* (which I have not seen) "obovate, sessile, mostly axillary." (*Carm.*) *Substance* membranaceous. *Colour* a clear crimson-red.

A minute and little known, but perhaps not uncommon species, in many respects allied to *C. Daviesii*, and in some approaching *C. Rothii*, but differing from both in the very simple filaments and flexuous branches. I have made my drawing from a part of Captain Carmichael's original specimen, preferring to use, in this

instance, materials about which there could be no mistake; but I have not been able to find, on the portion examined, the axillary tetraspores which that observer describes. Such characters as the barren filaments supply are faithfully given in the annexed plate.

Fig. 1. Tufts of *CALLITHAMNION SPARSUM*, growing on an old stem of *Laminaria*:—*natural size*. 2. A few fronds from one of the tufts. 3. Portion of a branch:—*more or less magnified*.

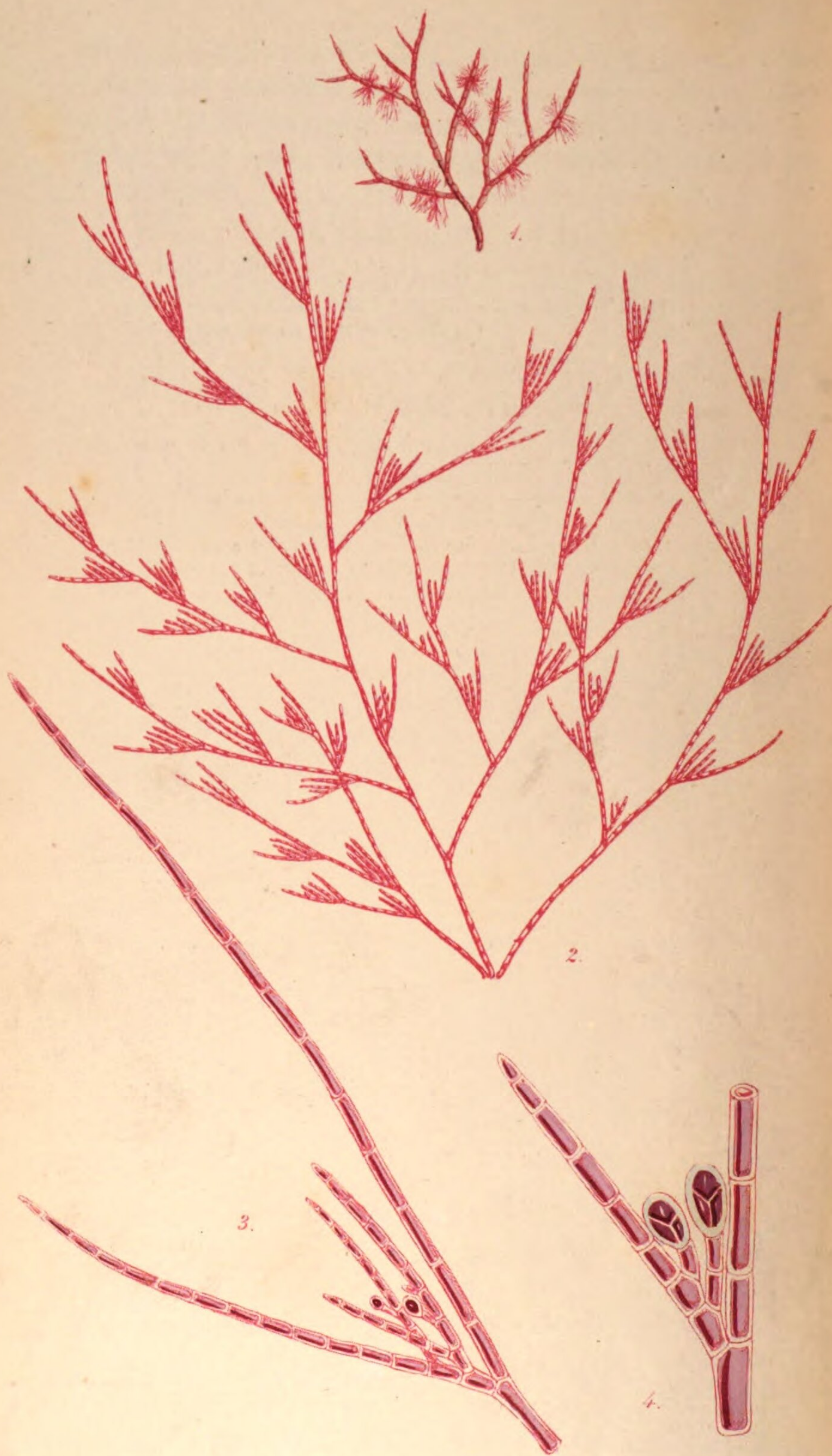


PLATE CCCXIV.

CALLITHAMNION DAVIESII, *Lyngb.*

GEN. CHAR. *Fronde* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants: 1, external *tetraspores*, scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular *spores*. CALLITHAMNION (*Lyngb.*),—from *καλλος*, *beauty*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *Daviesii*; rose-red, minute, tufted, much branched; branches curved, scattered, patent; ramuli of several cells, fascicled, or crowded toward the axils of the secondary branches; tetraspores pedicellate, borne on the axillary ramuli.

CALLITHAMNION *Daviesii*, *Lyngb. Hyd. Dan.* p. 129. t. 41. *Ag. Sp. Alg.* vol. ii. p. 186. *Harv. in Hook. Brit. Fl.* vol. ii. p. 348. *Harv. Man.* ed. 1. p. 117. ed. 2. p. 184. (*in part*). *Kütz. Spec. Alg.* p. 638. (*in part*).

TRENTEPOHLIA *Daviesii*, *Harv. in Mack. Fl. Hib.* part 3. p. 219.

CONFERVA *Daviesii*, *Dillw. Conf. t. F. E. Bot.* t. 2329.

HAB. Parasitical on *Ceramium rubrum* and other small Algæ, in pools between tide-marks. Annual. Summer and Autumn. Anglesea, *Rev. H. Davies*. Bantry, *Miss Hutchins*. Torquay, *Mrs. Griffiths*. Brighton, *Mr. Borrer*; and perhaps generally distributed round our shores.

GEOGR. DISTR. Atlantic Shores of Europe. North America.

DESCR. *Filaments* two to four lines high, forming small, pencil-like tufts, or spreading continuously, sometimes but slightly divided, sometimes much branched, the branches in one or two series, curved, spreading. *Primary* branches elongated, destitute of ramuli, but bearing usually, at considerable intervals, two or more rather short, *secondary* branches, which are either alternate or secund, and are furnished near their base, almost at the axil, with several secund closely-placed ramuli. *Ramuli* of several cells, either simple or slightly branched, rarely scattered. *Tetraspores* pedicellate, borne on the supra-axillary ramuli, elliptical. *Colour* a fine rosy red. *Substance* membranaceous and delicate. In drying, the plant adheres closely to paper.

Under the last plate I have stated the close affinity which connects this species with the *Cal. virgatulum*, there figured. Both

are beautiful microscopic objects, but particularly *C. virgatulum*, for I find *C. Daviesii* very generally infested by parasites still more minute than itself, and particularly in and about the axillary ramuli. I do not find it so generally fertile as *C. virgatulum*; the crowding of parasites, and collection of dirt about the ramuli where the tetraspores are borne, probably destroying the fructification.

This little plant bears the name of the late Rev. Hugh Davies, an able botanist of the last generation, whose name will be familiar to the readers of 'English Botany.' He discovered it early in the present century, on the Welsh coast, and it has been found (under one or other of its varieties) in most parts of our shores, on those of Europe, and in America.

Fig. 1. Part of a frond of *Ceramium rubrum*, infested with *CALLITHAMNION DAVIESII*. 3. Fronds of *Callithamnion Daviesii*:—*magnified*. 3. Portion of a branch. 4. Axillary ramuli and tetraspores from the same:—*more or less highly magnified*.



PLATE CCCXIII.

CALLITHAMNION VIRGATULUM, *Harv.*

GEN. CHAR. *Frond* rosy or brownish-red, filamentous; stem either opaque and cellular, or translucent and jointed; branches jointed, one-tubed, mostly pinnate (rarely dichotomous or irregular); dissepiments hyaline. *Fruit* of two kinds, on distinct plants: 1, external *tetraspores* scattered along the ultimate branchlets, or borne on little pedicels; 2, roundish or lobed, berry-like receptacles (*favellæ*) seated on the main branches, and containing numerous angular spores. CALLITHAMNION (*Lyngb.*),—from *καλλος*, *beauty*, and *θαμνιον*, *a little shrub*.

CALLITHAMNION *virgatulum*; rose-red, minute, tufted, much branched; branches long and straight, erecto-patent, alternate or secund; ramuli from every joint, short, obtuse, mostly secund; articulations thrice as long as broad; tetraspores scattered along the branches.

CALLITHAMNION *virgatulum*, *Harv. in Hook. Br. Fl.* vol. ii. p. 349. *Wyatt, Alg. Danm.* No. 189.

CALLITHAMNION *Daviesii*, *var.*, *Harv. Man.* ed. 1. p. 117, ed. 2. p. 184.

HAB. Parasitical on *Ceramium rubrum*, in pools between tide-marks. Torquay, *Mrs. Griffiths*.

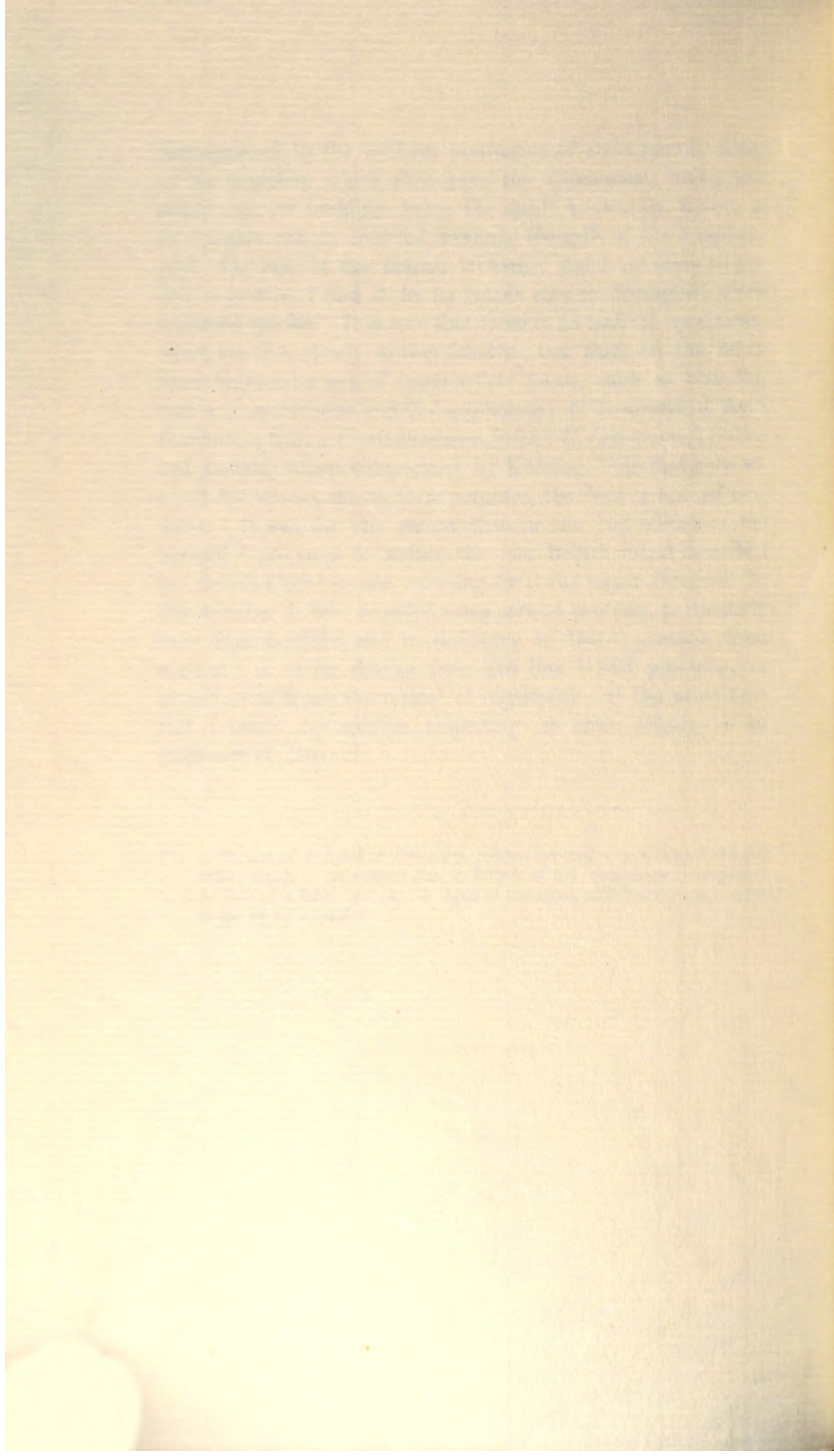
GEOGR. DISTR. — ?

DESCR. *Filaments* from two to four lines high, erect, forming little pencil-like tufts, or clothing the stems of the *Ceramium* continuously, in patches 1-2 inches in line, much branched. *Branches* erect, or erecto-patent, long, straight or gently curved, rod-like, with a few scattered similar secondary branches, which are either alternate or secund. *Ramuli* springing from nearly every joint of the primary and secondary branches, mostly secund, sometimes two together, very short, usually consisting of a single cell, obtuse. *Tetraspores* (formed from altered ramuli) scattered plentifully along the branches, secund or two together, either sessile or raised on little stalks. *Colour* a fine, clear, rosy red, preserved in drying. *Substance* membranaceous, delicate. The plant adheres closely to paper.

If we confine our attention to specimens that strictly answer to the characters illustrated in this and the following plate, *C. virgatulum* and *C. Daviesii* appear to be very distinct one from the other, and easily recognized at a glance:—the former

distinguished by the uniform production of short ramuli along all its branches, which thus have the appearance, under the microscope, of budding rods; the latter known by having a few longish ramuli crowded towards the axils of the branches, while the rest of the branch is bare. But I am sorry to say that in practice I find it by no means easy to distinguish these supposed species. It is true that there is no lack of specimens, which are thus clearly distinguishable; but then, on the other hand, there is no lack of intermediate forms, such as bear the names *C. secundatum* and *C. lanuginosum*; *C. luxurians*, J. Ag.; *C. mirabile*, Kütz.; *C. minutissimum*, Suhr.; *C. Lenormandi*, Suhr.; and probably others enumerated by Kützing. So that once we admit *two* species among these parasites, the door is opened to a dozen. It was for this reason that in the last edition of the Manual I proposed to reduce the four British forms described in 'British Flora' to one, retaining for it the name *Daviesii*. To this decision I have received some earnest protests, particularly from Mrs. Griffiths, and in deference to this "pressure from without" I so far deviate from the line I had prescribed to myself, as to figure the typical *C. virgatulum*; at the same time that I retain my opinion respecting its close affinity—if no more—to *C. Daviesii*.

Fig. 1. Portion of a frond of *Ceramium rubrum* infested with *CALLITHAMNION VIRGATULUM*:—*the natural size*. 2. Fronds of *Cal. virgatulum*:—*magnified*. 3. Part of a fertile branch. 4. Apex of the same, with tetraspores:—*more or less highly magnified*.





Harvey, Will. Henr.

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